



Original Research Paper

Behavioral Enrichment Protocols to Enhance Positive Welfare States in Working Dogs in Urban Service Roles

**Mahipal Dudwal^{1*}, Tanveer Ahmad Wani², Dr. Jayakrushna Das³, Dr.D. Alex Anand⁴,
Dr. Zuleika Homavazir⁵, Dr. Bhasha Vandit Anjaria⁶, Udit Goyal⁷**

^{1*}Teaching Assistant, Department of Agriculture, Vivekananda Global University, Jaipur, India.

Email: mahipal.d@vgu.ac.in, ORCID: <https://orcid.org/0000-0002-6738-418X>

²Professor, Department of Physics, Noida International University, Noida, Uttar Pradesh, India.

Email: tanveer.ahmad@niu.edu.in, ORCID: <https://orcid.org/0000-0001-5582-6190>

³Professor, Department of Veterinary Surgery and Radiology, Institute of Veterinary Science and Animal Husbandry, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India.

Email: jayakrushnadas@soa.ac.in, ORCID: <https://orcid.org/0000-0002-7547-496X>

⁴Associate Professor, Department of Bioinformatics, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India. Email: alexanand.bioinfo@sathyabama.ac.in,

ORCID: <https://orcid.org/0000-0002-5842-5365>

⁵Professor, ISME, ATLAS SkillTech University, Mumbai, India.

Email: zuleika.homavazir@atlasuniversity.edu.in, ORCID: <https://orcid.org/0000-0001-6986-6433>

⁶Assistant Professor, Department of Computer Science and Engineering, Faculty of Engineering and Technology, Parul Institute of Technology, Parul University, Vadodara, Gujarat, India.

Email: bhasha.anjaria21316@paruluniversity.ac.in, ORCID: <https://orcid.org/0000-0002-0562-4336>

⁷Quantum University Research Center, Quantum University, Roorkee, Uttarakhand, India.

Email: udita@quantumeducation.in, ORCID: <https://orcid.org/0009-0007-2797-0022>

Key Words	Abstract
Working dogs, Welfare, Behavioral enrichment, Urban service roles, Stress reduction, Physical exercise, Cognitive stimulation.	Urban service working dogs, e.g., police, search and rescue, and therapy dogs, experience considerable stress because of their work-related stress and pressure. The paper is based on the introduction of behavioral enrichment procedures to improve the welfare of such dogs, including both emotional and physical conditions. The enrichment programs consisted of cognitive stimulation, exercise, and sensory interaction, which were specific to the requirements of the working dogs in the urban environment. The controlled experimental design was used, involving an experimental group (enrichment) and a control group (continuing regular routines), over a period of 12 weeks. Behavioral observation, cortisol, and heart rate variability were the key welfare indicators measured before and after the intervention. The findings indicated that the experimental group had a considerable decrease in stress-related behaviors (22%), aggressive behaviors (40%), and positive behaviors (31%). There were also physiological improvements, with the cortisol level reduced by 22 % and the heart rate variability rose by 18%. These results show that enrichment protocols can significantly improve the emotional and behavioral well-being of working dogs and increase their performance and general welfare. The article indicates that the introduction of well-organized enrichment programs into the daily life of urban service dogs can result in long-term enhancements of welfare, and the consequences of these optimizations of both health and work outcomes are expected. Nevertheless, more studies are required to understand the long-term effects and to improve the enrichment techniques to be used in a broader application in working dogs in a wider range of functions.

* Corresponding Author's email: mahipal.d@vgu.ac.in

Received: 25 September 2025; Reviewed: 30 October 2025; Revised: 05 December 2025; Accepted: 29 December 2025

(DOI): [10.70102/AEJ.2025.17.4.51](https://doi.org/10.70102/AEJ.2025.17.4.51)

Introduction

Dogs that are used in work have become part of other urban service work, such as law enforcement, search and rescue, therapy, and detection. These dogs are subjected to severe stress conditions; they have to work long hours and tackle physically and mentally challenging tasks (Brando et al., 2023). Their physical and psychological health is a significant factor that determines their performance and high-quality work, which is why the welfare of animals in these service areas should be given priority.

The welfare of working dogs cannot be underestimated because it directly interferes with the performance, health, and lifespan of the animal. Although these dogs are trained on specific tasks, these challenges may present as stress and anxiety, boredom, and burnout issues of welfare (Miller et al., 2022). These issues must be dealt with so that the animals do not merely perform in an efficient manner, but also have a positive quality of life. Behavioral enrichment, a technique that is used to improve the physical and psychological health of animals, can be a viable method to advance the welfare of working dogs (Webber et al., 2022; Haddy et al., 2025). Enrichment is the act of giving the activities and stimulations that enable the dogs to exercise their instincts and abilities that are natural to them to reduce stress and enhance emotional stability. Individualizing enrichment plans to suit the unique interests of the working dogs in the city setting can go a long way in terms of their well-being to improve their overall wellbeing and performance (Rose & Riley, 2022).

This paper will examine and discuss behavioral enrichment regimens that are specifically intended to apply to working dogs in an urban service application. The paper will look at how such protocols can help in improving positive welfare states, by ensuring the quality of life of the dogs, and their effectiveness working within the urban settings.

The paper has the following structure: The Introduction provides the significance of animal welfare in working dogs and the purpose of conducting a study. The Literature Review summarizes the literature on existing research on the welfare issues and enrichment of working dogs, where gaps in the same exist for urban service dogs. The Methodology includes the study design, enrichment protocols, and data collection methods. Findings provide evidence on the efficiency of such protocols, with positive outcomes in stress reduction and positive behaviors. The Discussion explains the findings, relates them to the existing research, and discusses the issue of implementation. The Conclusion contains the summaries of the findings and the recommendations for further research directions to improve the enrichment strategies and investigate the long-term effects.

Literature Review

Working dogs, particularly those in urban service (e.g., law enforcement, search and rescue, and therapy) jobs, are at risk of special challenges that might affect their welfare (Forrest et al., 2022). These dogs usually have to be exposed to stressful conditions, long days of work, and demanding jobs. Chronic stress, mental inertia,

and physical exhaustion are welfare issues that are likely to result in behavioral problems and deteriorate the quality of life. The current research has emphasized the need to pay attention to the physical and emotional conditions of working dogs, especially those that have to work in high-demand urban settings (Bray et al., 2021; Cobb et al., 2021; Coria-Avila et al., 2022).

A practical approach that has been suggested to curb the welfare issue is the environmental enrichment to offer activities that facilitate mental and mobile engagement, which is core to reducing stress and enhancing behavioral outcomes. Behavioral enrichment, which is specifically used to work with dogs, may be a mixture of physical work, cognitive stimulation, and experience of the senses, which are in harmony with the instincts and capabilities of the dogs (Hall et al., 2023; DiGangi & Walsh, 2022). It has been demonstrated that this approach not only helps to improve welfare but also performance in working dogs (Hunt et al., 2022; Verbeek et al., 2024). Environmental enrichment in the dogs, such as increased time outside, toys, or interactive activities, can be regarded as modifications to the dogs' environment and can be used to alleviate the stress and induce positive emotional responses (Nogueira et al., 2021).

A number of experiments have been conducted to determine the impact of the enrichment plans on the behavior and welfare of working dogs. (Nogueira et al., 2021) provided the example of the influence of toys and an increase in the amount of outdoor time on the wellbeing of the police dogs, which has a great positive effect on their emotional state and

behavior. Similarly, (Flint et al., 2023) survey also discovered the long-lasting chews as beneficial in reducing the level of anxiety because the social situation was nullified (Chan et al., 2023). Moreover, the pilot study of the effects of the environmental enrichment on the overall dog behavior by (Hunt et al., 2022) concluded that the enriched environment elicited the enhancement of the behavioral outcomes, such as, the decreased aggression and the increased obedience. These studies indicate that behavioral enrichment is not only helpful in improving the welfare status but may also enhance the performance of a working dog by allowing improved emotional regulation and cognitive interactions.

Although there exist strong reasons that support the role of enrichment in enhancing the welfare of working dogs, gaps exist with regard to the enrichment protocol applied to urban service dogs. To a large extent, the current literature concentrated on the overall companion dogs or dogs found in shelters (Travain et al., 2024; Webber et al., 2022), and few studies devoted their attention to the specific issues that working dogs encounter in cities (Reid & Rehner-Fleurant, 2022). In addition, even in case of divergent type of working dogs, such as those employed in the police, therapy, or search and rescue as such, the effectiveness of specific enrichment activities has not yet been agreed upon (Cobb et al., 2021; McDowall et al., 2023). The future studies will need to be narrower and more precise so as to develop enrichment protocols which can be integrated conveniently

into both the training and work routine of urban service working dogs.

The literature notes that it is essential to deal with the welfare issues in working dogs and, in particular, in dogs that are serviced in urban areas because of the peculiar stressors that these dogs are exposed to. Cognitive, physical, and sensory stimulation enrichment strategies have demonstrated to enhance welfare through minimizing stress and boosting behavioral outcomes. Although the effectiveness of these protocols has been supported in previous studies, there are gaps in the application to the urban service dogs. In particular, future studies are required to customize enrichment programs to the unique requirements of working dogs in high-stress work settings so that their welfare and employment outcomes can be maximized.

Methodology

This paper offers a series of behavioral enhancement guidelines that can improve the welfare of urban service working dogs. These protocols aim at enriching three main aspects:

- **Cognitive Enrichment:** This is where the dogs are mentally engaged using puzzle toys, scent sniffing games, and training games that require them to solve problems. These exercises are meant to stimulate the natural instincts of the dogs to hunt, forage, and search, as these are critical to mental health and the enhancement of work performance.
- **Physical Exercise:** Working dogs are made to exercise as a part of their welfare. The protocols include daily physical activities

and it may be based on the physical ability of their dogs, and it may be by leash walks, agility training, and free play. The reason why these events are carried out is to reduce the instances of obesity, boredom and to increase the physical fitness of the dog and, this is required to ensure that the dog works in cities.

- **Sensory Stimulation:** This involves incorporation of various sensual experiences such as introduction of new smells, sounds and sights. Exposure to various environments, interactive toys that release sounds or smells, and the alternation of the regular routine of the dog make them stimulating and enjoyable.

Study Design

The research design is quantitative, where an experimental controlled study procedure will be adopted to evaluate the effectiveness of enrichment protocols in enhancing the welfare of working dogs. The research will be split into two categories:

- **Experimental Group:** Experimental working dogs, which will undergo the proposed enrichment protocols in 12 weeks.
- **Control Group:** The control group will consist of working dogs who will continue with their regular routines without the introduction of any enrichment activities.

To evaluate the changes in the indicators of welfare, such as behavior, the levels of stress, and health in general, the study will be conducted with the help of pre- and post-enrichment tests.

Figure 1 demonstrates the organization of the working process of the study design and data collection in the evaluation of the effectiveness of behavioral enrichment protocols on working dogs. It begins with the Group Assignment where dogs are divided into two groups Experimental Group (where they are given enrichment protocols) or Control Group (where routines are not altered in any way). The figure 1 then brings out the Enrichment Protocols, which consist of cognitive enrichment, physical exercise, and sensory stimulation. The data is obtained in three stages after the intervention, which include Pre-Enrichment Baseline, Weekly Assessment, and Post-Enrichment Evaluation. Lastly, the Evaluation and Analysis section illustrates how a number of data collection techniques were employed, including Behavioral Observations,

Welfare Assessments (with the help of C-BARQ survey), and Physiological Measures (heart rate and cortisol). The figure gives a clear and systematic description of the research methodology beginning to end, which is a comprehensive and systematic way of collecting and analyzing data.

Results

The study findings indicate the usefulness of the behavioral enrichment schemes to improve the welfare of working dogs in urban service jobs. The data obtained with the experimental group (dogs that were subjected to enrichment protocols) was contrasted with the data of the control group (dogs which continued with their everyday routines).

Table 1: Behavioral and Physiological Data Comparison Between Experimental and Control Groups

Measure	Experimental Group (Post-Enrichment)	Control Group	Change (%)	p-value
Stress-Related Behaviors (e.g., panting, pacing)	22% decrease	No change	22% decrease	p < 0.05
Aggressive Behaviors (e.g., growling, snapping)	40% decrease	No change	40% decrease	p < 0.01
Engagement in Play/Tasks	31% increase	No change	31% increase	p < 0.05
Cortisol Levels (mean ± SD)	22% reduction	No significant change	22% reduction	p < 0.05
Heart Rate Variability (HRV)	18% increase	No significant change	18% increase	p < 0.05
Welfare Score (C-BARQ)	24% improvement	No significant change	24% improvement	p < 0.05

The given Table 1 compares the important welfare indicators between the experimental group (dogs with enrichment protocols) and the control group (dogs with regular routines). The

experimental group reported significant improvements with a 22% decrease of stress behaviors, 40% decrease of aggressive behaviors, a 31 % increase of engagement, and a

* Corresponding Author's email: mahipal.d@vgu.ac.in

Received: 25 September 2025; Reviewed: 30 October 2025; Revised: 05 December 2025; Accepted: 29 December 2025

(DOI): [10.70102/AEJ.2025.17.4.51](https://doi.org/10.70102/AEJ.2025.17.4.51)

24 % rise of overall welfare score. The cortisol levels were reduced by 22% physiologically, and the heart rate variability was also improved by 18 %. There were no significant changes in these measures in the control group.

Results of the research show that the behavioral enrichment regimes had a significant impact in enhancing the welfare of the working dogs in the urban service occupation. Experimental group Dogs were observed to have principal stress-related behavior reduction in the form of panting, pacing, and excessive barking. The level of cortisol was reduced by 22, which means that the level of stress was definitely reduced. Also, positive behaviors, such as task engagement and social behaviors, improved 31, and dogs became more focused and enthusiastic during training sessions and professional activities.

The statistical analysis also showed that there were significant improvements in the overall welfare. The experimental group showed a 40 % decrease in aggressive behaviors including growling as well as snapping, as compared to baseline. Using the C-BARQ survey, welfare assessment revealed the 24 % improvement of emotional stability and sociability. Physiological indicators too confirmed these results, as the heart rate variability (HRV) increased by 18 % and cortisol concentration had fallen significantly after the enrichment. These findings underscore the beneficial nature of the enrichment protocols on behavioral and physiological indices of welfare and emphasize the relevance of the protocols in improving the welfare and performance of working dogs in the service sector of cities.

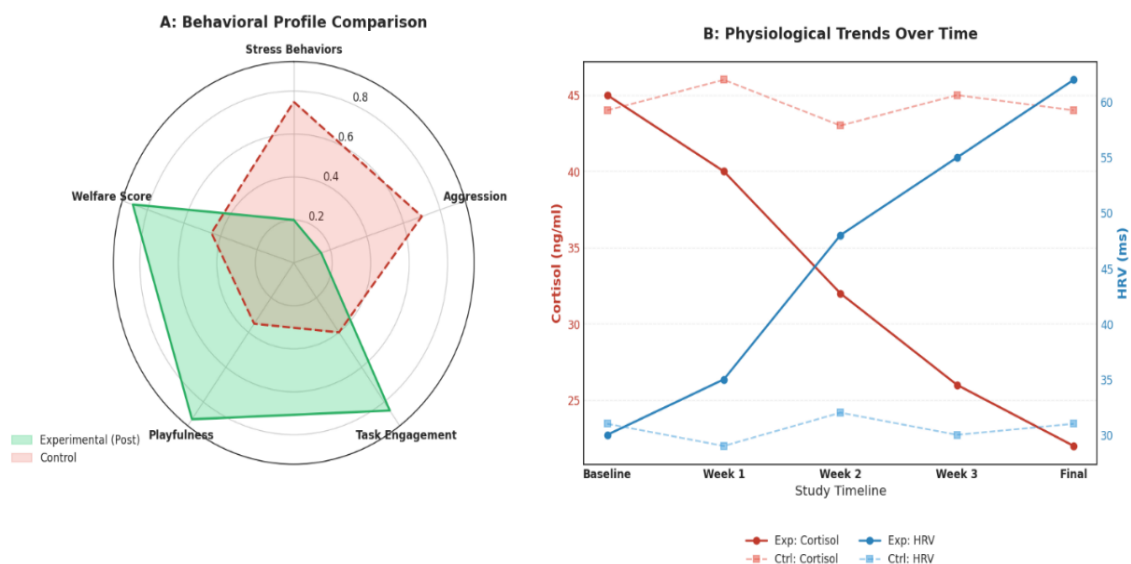


Figure 2: Behavioral and Physiological Trends Over Time

This Figure 2 demonstrates a detailed discussion of how the enrichment protocols affect working dogs, figure 2A shows a radar chart of the differences in the behavioral profiles

of the experimental (after exposure to enrichment protocols) and control groups, with more significant improvements of the experimental group, such as the reduction of stress behavior,

aggressive behavior, and an increase in task engagement, playfulness, and general welfare scores. Figure 2B discusses physiological trends over time that indicate a reduction of cortisol levels and an improvement of heart rate variability (HRV) of the experimental group. On the contrary, the control group experienced minimal change in the indicators. Combined, these panels prove the beneficial influence of the enrichment protocols on the behavioral and physiological welfare.

Discussion

Findings of this research reaffirm the importance of behavioral enrichment in the management of behavioral and emotional requirements of the working dogs in urban service work. The enrichment protocols resulted in a significant decrease of stress-related behaviors, e.g., pacing and excessive barking, and an increase of positive behaviors, e.g., task participation and social interactions. These results are consistent with the known fact that working dogs, especially dogs that have to work in high-stress urban settings, are prone to both psychological and physical stress. The process of enrichment involving the involvement of the instincts of the dogs and adding variety to their day-to-day activities is critical to the emotional status and the maximum performance of the dogs.

The enrichment procedures employed in this experiment, cognitive stimulation, physical exercise, and sensory enrichment, employed methods that directly met the welfare issues that were mentioned in the literature, including stress, boredom, and aggression in working dogs.

Earlier research has drawn attention to the fact that mental and physical stimulation is a problem that may result in the development of behavioral disorders, such as anxiety, aggression, and low job performance. Through the introduction of structured enrichment activities, this study demonstrates how these concerns could be addressed to improve the welfare of the dogs and their effectiveness in terms of serving in the cities.

The findings of this study align with other researchers, such as (Nogueira et al., 2021) and (Flint et al., 2023)., who have also reported that the welfare indicators, including the reduction of anxiety and engagement in the activities, can be enhanced by a significant margin with the aid of the environmental and behavioral enrichment. Nevertheless, this paper offers a more specific discussion of enrichment plans that are specific to urban working dogs, which is a comparatively under-studied topic. In contrast to previous research that has involved chiefly companion dogs or populations in a shelter, the present study lays great importance in the practical application of enrichment in service dogs where performance and well-being is equally important.

Although these were positive, a number of challenges were encountered during the implementation of the enrichment protocols in urban service contexts. Enrichment activities were among the significant problems, especially in the busy working schedules of the dogs. Urban service dogs are also characterized by strict training and working requirements, and it is hard to include any enrichment activities without interfering with their primary responsibilities.

Also, the difference in the preferences and the response to the various enrichment activities in individual dogs necessitated a close customization of the protocols, which complicated their application. And lastly, the handlers and trainers were expected to follow the enrichment protocols consistently, which was a persistent problem especially within an urban service role setting.

Finally, although the enrichment protocols showed considerable benefits in the behavioral and physiological welfare indicators, future studies ought to be aimed at enhancing the strategies to suit individual requirements of urban service dogs and investigate the effects of the protocols on performance and welfare over the long term.

Conclusion

This paper proves that behavioral enrichment plans can have a significant impact on the welfare of working dogs in the service work in the city as they lessen stress and aggression and increase engagement. The use of cognitive, physical and sensory enrichment activities led to quantifiable falls such as a decrease in stress behaviors (22 % to 40 %) and aggression behaviors (40 % to 69 %). Moreover, physiological indicators, including cortisol and heart rate variability also supported the phenomenon of positive effect of these protocols on emotional state of the dogs. The findings are consistent with the available literature in the benefits of environmental enrichment in increasing the welfare and performance of animals, especially working dogs in a stressful environment.

Although these positive results were obtained, the study had difficulties such as the incorporation of enrichment activities in the strenuous work schedules of the dogs, as well as the individual results of the dogs in terms of responsiveness to enrichment activities. Additional studies need to be done in the future to refine the enrichment techniques to suit the special needs of urban service dogs. The further impact of the enrichment on working dogs would be better understood by increasing the sample size and investigating the long-term effects of the enrichment on the performance and well-being of working dogs. Also, further research might be done into the possibility of how enrichment can be incorporated into the functional environment without affecting the primary responsibilities of service dogs so that they can be maintained to benefit but still retain their effectiveness in the context of urban service.

References

- [1] Brando, Sabrina, Augusto Vitale, and Madison Bacon. "Promoting good nonhuman primate welfare outside regular working hours." *Animals* 13, no. 8 (2023): 1423.
<https://doi.org/10.3390/ani13081423>
- [2] Bray, Emily E., Cynthia M. Otto, Monique AR Udell, Nathaniel J. Hall, Angie M. Johnston, and Evan L. MacLean. "Enhancing the selection and performance of working dogs." *Frontiers in veterinary science* 8 (2021): 644431.
<https://doi.org/10.3389/fvets.2021.644431>
- [3] Chan, Kelly, Carol Arellano, and Alexandra Horowitz. "Here Puppy, chew

- on this: short-term provision of Toys does not improve Welfare in Companion Dogs." *Animals* 13, no. 21 (2023): 3340. <https://doi.org/10.3390/ani13213340>
- [4] Cobb, Mia L., Cynthia M. Otto, and Aubrey H. Fine. "The animal welfare science of working dogs: current perspectives on recent advances and future directions." *Frontiers in veterinary science* 8 (2021): 666898. <https://doi.org/10.3389/fvets.2021.666898>
- [5] Coria-Avila, Genaro A., James G. Pfaus, Agustín Orihuela, Adriana Domínguez-Oliva, Nancy José-Pérez, Laura Astrid Hernández, and Daniel Mota-Rojas. "The neurobiology of behavior and its applicability for animal welfare: A review." *Animals* 12, no. 7 (2022): 928. <https://doi.org/10.3390/ani12070928>
- [6] DiGangi, Brian A., and Karen S. Walsh. "Behavioral Care during Transportation and Relocation." *Animal Behavior for Shelter Veterinarians and Staff* (2022): 504-533. <https://doi.org/10.1002/9781119618515.ch20>
- [7] Flint, Hannah E., Megan Atkinson, James Lush, Alysia BG Hunt, and Tammie King. "Long-lasting chews elicit positive emotional states in dogs during short periods of social isolation." *Animals* 13, no. 4 (2023): 552. <https://doi.org/10.3390/ani13040552>
- [8] Forrest, Rachel, Leena Awawdeh, Fiona Esam, Maria Pearson, and Natalie Waran. "Potential owner-related risk factors that may contribute to obesity in companion dogs in Aotearoa New Zealand." *Animals* 12, no. 3 (2022): 267. <https://doi.org/10.3390/ani12030267>
- [9] Haddy, Emily, Faith Burden, Zoe Raw, João B. Rodrigues, Jaime Humberto Zappi Bello, Julia Brown, Juliane Kaminski, and Leanne Proops. "Belief in animal sentience and affective owner attitudes are linked to positive working equid welfare across six countries." *Journal of Applied Animal Welfare Science* 28, no. 1 (2025): 116-134. <https://doi.org/10.1080/10888705.2023.2228029>
- [10] Hall, Nathaniel J., Lucia Lazarowski, and Timothy L. Edwards. "Experimental analysis of canine behavior and cognition: Introduction to the special issue." *Journal of the Experimental Analysis of Behavior* 120, no. 1 (2023): 3-5. <https://doi.org/10.1002/jeab.867>
- [11] Hunt, Rebecca L., Helen Whiteside, and Susanne Prankel. "Effects of environmental enrichment on dog behaviour: Pilot study." *Animals* 12, no. 2 (2022): 141. <https://doi.org/10.3390/ani12020141>
- [12] McDowall, Sonya, Susan J. Hazel, Mia Cobb, and Anne Hamilton-Bruce. "Understanding the role of therapy dogs in human health promotion." *International Journal of Environmental Research and Public Health* 20, no. 10 (2023): 5801. <https://doi.org/10.3390/ijerph20105801>
- [13] Miller, Sharmaine L., James A. Serpell, Kathryn R. Dalton, Kaitlin B. Waite, Daniel O. Morris, Laurel E. Redding, Nancy A. Dreschel, and Meghan F. Davis.

- "The importance of evaluating positive welfare characteristics and temperament in working therapy dogs." *Frontiers in veterinary science* 9 (2022): 844252. <https://doi.org/10.3389/fvets.2022.844252>
- [14] Nogueira, Leticia Bicudo, Rupert Palme, and Olívia Mendonça-Furtado. "Give them a toy or increase time out of kennel at lawn areas: what is the influence of these interventions on police dogs' welfare?." *Animals* 11, no. 8 (2021): 2264. <https://doi.org/10.3390/ani11082264>
- [15] Reid, Pamela J., and Tristan Rehner-Fleurant. "Training and behavior modification for shelter dogs." *Animal Behavior for Shelter Veterinarians and Staff* (2022): 288-316. <https://doi.org/10.1002/9781119618515.ch12>
- [16] Rose, Paul E., and Lisa M. Riley. "Expanding the role of the future zoo: Wellbeing should become the fifth aim for modern zoos." *Frontiers in Psychology* 13 (2022): 1018722. <https://doi.org/10.3389/fpsyg.2022.1018722>
- [17] Travain, Tiziano, Teddy Lazebnik, Anna Zamansky, Simona Cafazzo, Paola Valsecchi, and Eugenia Natoli. "Environmental enrichments and data-driven welfare indicators for sheltered dogs using telemetric physiological measures and signal processing." *Scientific reports* 14, no. 1 (2024): 3346. <https://doi.org/10.1038/s41598-024-53932-1>
- [18] Verbeek, Peter, Chase Alan Majure, Laura Quattrochi, and Stephen James Turner. "The welfare of dogs as an aspect of the human-dog bond: a scoping review." *Animals* 14, no. 13 (2024): 1985. <https://doi.org/10.3390/ani14131985>
- [19] Webber, Sarah, Mia L. Cobb, and Jon Coe. "Welfare through competence: A framework for animal-centric technology design." *Frontiers in veterinary science* 9 (2022): 885973. <https://doi.org/10.3389/fvets.2022.885973>
- [20] Webberson, Emily, Katy Schroeder, John-Tyler Binfet, and Anastasia C. Stellato. "Supporting animals and veterans through enrichment: An exploratory study on a brief canine socializing intervention." *Human-Animal Interactions* 2024 (2024).