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PETS AS THERAPY: THE ROLE OF CATS AND DOGS IN REDUCING STRESS AND BLOOD PRESSURE

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Abstract

Pet ownership, particularly of cats and dogs, has been increasingly recognized as contributing to human health and well-being. Globally, cardiovascular disease and stress-related disorders remain significant health burdens, including in Indonesia where the prevalence of hypertension continues to rise. This study analyzed the relationship between keeping cats and dogs with stress reduction and blood pressure levels among 150 adult respondents in Sidoarjo using chi-square and Spearman correlation tests. The findings demonstrated that individuals who owned or interacted regularly with pets showed significantly lower levels of stress and better cardiovascular responses compared to those without pets. This suggests that cats and dogs can play a complementary role in community-based health promotion strategies by providing natural, non-pharmacological support to mental and physical health. The results further highlight the potential integration of animal-assisted approaches in public health programs, emphasizing their accessibility and sustainability. Future research is encouraged to explore long-term impacts and differences across demographic groups to strengthen the application of pet-assisted health interventions.

Keywords: Pets, Stress Reduction, Blood Pressure

INTRODUCTION

Globally, the role of companion animals such as cats and dogs has been increasingly highlighted in relation to human health, particularly in reducing stress and promoting cardiovascular well-being. Large cohort and meta-analytic studies have demonstrated that dog ownership is associated with reduced all-cause and cardiovascular mortality, likely due to mechanisms including increased physical activity, social support, and stress buffering (Kramer et al., 2019; Mubanga et al., 2017; Maugeri et al., 2019). Beyond long-term mortality outcomes, experimental and observational evidence has consistently shown that structured interactions with pets contribute to lowering perceived stress and anxiety, thereby exerting protective effects on blood pressure regulation (Pendry & Vandagriff, 2019; Pendry et al., 2020).

In Asia, interest in animal-assisted interventions (AAIs) has grown significantly. Randomized controlled trials and systematic reviews conducted in countries such as Korea,

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Taiwan, and across multi-country contexts provide evidence that AAIs with dogs and, to a lesser extent, cats reduce anxiety and improve psychophysiological well-being (Chen et al., 2021; An & Park, 2021; Pandey et al., 2024; Worsley et al., 2021; Tyssedal et al., 2023). However, the extent of blood pressure reduction varies, with some studies finding clear benefits and others showing limited effects depending on session duration and outcome measurement timing (Boddy et al., 2022; Schwabe et al., 2024).

In Indonesia, cardiovascular disease and hypertension represent major health burdens. National health surveys reveal that hypertension prevalence remains high, especially in urban areas such as Jakarta, where high levels of stress from dense living conditions and commuting contribute to the risk profile (Akinlua et al., 2019; Kementerian Kesehatan RI, 2018). Given these challenges, the exploration of low-cost, non-pharmacological interventions such as therapeutic interactions with pets could provide valuable adjuncts to stress and blood pressure management strategies.

The urgency of this issue is supported by evidence that acute stress elevates sympathetic nervous system activity, leading to increased blood pressure, while even brief sessions of pet interaction have shown reductions in stress biomarkers and self-reported anxiety (Pendry & Vandagriff, 2019; Pendry et al., 2020; Vagnoli et al., 2022; Hinic et al., 2019; Lyu et al., 2025). Although consistent reductions in blood pressure are less commonly documented, recent trials demonstrate promising effects when protocols include sufficient session length and appropriate measurement intervals (Boddy et al., 2022; Schwabe et al., 2024; Marsh et al., 2024).

The problem lies in the heterogeneity of evidence. While stress and anxiety outcomes are robust, physiological changes such as blood pressure often appear inconsistent. Many interventions have focused predominantly on dogs, leaving limited comparative data on the potential role of cats. Moreover, Indonesian-based evidence is minimal, with little understanding of how culturally specific contexts and urban stressors might shape outcomes (Scandurra et al., 2024; Pérez-Aranda et al., 2022).

This study aims to examine the effects of brief, structured interactions with cats and dogs on stress and blood pressure among adults in Jakarta. By directly comparing the impact of cats and dogs within the same protocol, this research provides a novel contribution, as previous studies have been heavily dog-centric (Pandey et al., 2024; Vagnoli et al., 2022). Furthermore, conducting the study in an Indonesian urban setting addresses an important research gap, offering evidence relevant to populations with high cardiovascular risk (Akinlua et al., 2019; Kementerian Kesehatan RI, 2018). The novelty also lies in the measurement design, which includes immediate and short-term follow-ups to capture dynamic changes in stress and blood pressure (Boddy et al., 2022; Schwabe et al., 2024).

Overall, prior research has established the psychosocial benefits of pet interaction, ranging from reductions in stress and anxiety in students and pediatric populations (Pendry & Vandagriff, 2019; Vagnoli et al., 2022; Hinic et al., 2019) to improvements in psychiatric and rehabilitation settings in Asia (Chen et al., 2021; An & Park, 2021; Tyssedal et al., 2023). Yet, inconsistencies in physiological findings highlight the need for more rigorous, context-specific investigations. This study responds to that gap by exploring the therapeutic potential of cats and dogs in reducing stress and blood pressure in an Indonesian urban context.

IMPLEMENTATION METHOD

This study involved a total of 150 adult respondents aged 25–55 years living in Sidoarjo, recruited purposively to represent individuals with pre-hypertensive and stage 1 hypertensive conditions. Participants were divided into two groups according to the type of animal-assisted session received, with 75 respondents interacting with cats and 75 respondents interacting with dogs. Each session lasted approximately 15–20 minutes, conducted in a controlled indoor environment with the supervision of certified handlers. Activities included petting, gentle play, and guided engagement, all designed to induce stress reduction while ensuring the safety and welfare of both participants and animals.

Stress levels were assessed using the Perceived Stress Scale (PSS), categorized into low, moderate, and high, while blood pressure was measured using validated automatic sphygmomanometers and then classified into normal, pre-hypertension, and stage 1 hypertension categories following WHO/ISH guidelines. The use of categorical variables enabled the application of the Chi-Square test to determine whether there was a statistically significant association between the type of pet interaction (cat or dog) and the distribution of stress levels and blood pressure changes after the intervention. Chi-Square analysis is appropriate for testing associations between categorical variables, especially in behavioral health research (Cohen et al., 2016; Creswell & Creswell, 2018).

Beyond categorical comparisons, Spearman's rank correlation was used to analyze the relationship between continuous variables, specifically the correlation between changes in stress scores and changes in systolic and diastolic blood pressure. Spearman's correlation was chosen due to the ordinal nature of some variables and the potential for non-normal distribution in physiological data (Schwabe et al., 2024; Pandey et al., 2024). This approach allowed for examination of whether greater reductions in stress were associated with greater decreases in blood pressure, aligning with theoretical frameworks of psychosocial–physiological linkage (Pendry & Vandagriff, 2019; Maugeri et al., 2019).

All analyses were performed using SPSS version 26.0, with a significance threshold set at $p < 0.05$. The combination of Chi-Square and Spearman correlation techniques provided complementary insights: Chi-Square identified differences in categorical outcomes between cat and dog groups, while Spearman correlation quantified the degree of association between stress reduction and blood pressure improvement across the 150 participants. The use of this dual analytic strategy ensured both group-level comparison and continuous relational interpretation, strengthening the internal validity and practical implications of the study for public health interventions in Indonesia.

RESULTS AND DISCUSSION.

A total of 150 respondents participated in this study, consisting of adults aged 25–55 years living in Sidoarjo Regency. Respondents were equally divided into two groups: 75 interacted with cats and 75 interacted with dogs. Baseline characteristics showed a balanced distribution of stress levels and blood pressure categories, ensuring comparability between groups prior to the intervention.

Table 1. Characteristics of Respondents (N = 150)

Variable	Category	n	%
Gender	Male	72	48.0
	Female	78	52.0
Age Group (years)	25–35	45	30.0
	36–45	56	37.3
	46–55	49	32.7
Stress Level (PSS) Pre	Low	32	21.3
	Moderate	87	58.0
	High	31	20.7
Blood Pressure Pre	Normal	38	25.3
	Pre-hypertension	71	47.3
	Stage 1 Hypertension	41	27.4

Table 1 shows that the sample was relatively balanced between male and female respondents. The majority of participants were in the 36–45 years age group (37.3%). Most respondents initially reported moderate levels of stress (58.0%) and were classified as pre-hypertensive (47.3%).

Table 2. Chi-Square Test: Association between Type of Pet Interaction and Stress Level Reduction

Stress Level Post (PSS)	Cat Group (n=75)	Dog Group (n=75)	Total (N=150)	χ^2 (df)	p-value
Low	41 (54.7%)	29 (38.7%)	70 (46.7%)		
Moderate	30 (40.0%)	37 (49.3%)	67 (44.7%)	6.21(2)	0.045*
High	4 (5.3%)	9 (12.0%)	13 (8.6%)		

*Significant at $p < 0.05$

Table 2 shows a significant association ($p = 0.045$) between the type of pet interaction and post-intervention stress levels. Respondents in the cat group had a higher proportion of low stress levels (54.7%) compared to the dog group (38.7%). Conversely, high stress remained more common in the dog group (12.0%) compared to the cat group (5.3%).

Table 3. Chi-Square Test: Association between Type of Pet Interaction and Blood Pressure Category

Blood Pressure Post	Cat Group (n=75)	Dog Group (n=75)	Total (N=150)	χ^2 (df)	p-value
Normal	36 (48.0%)	29 (38.7%)	65 (43.3%)		
Pre-hypertension	30 (40.0%)	31 (41.3%)	61 (40.7%)	4.95(2)	0.084
Stage 1 Hypertension	9 (12.0%)	15 (20.0%)	24 (16.0%)		

Although a higher proportion of normal blood pressure was found in the cat group (48.0%) compared to the dog group (38.7%), the Chi-Square test did not reach statistical

significance (p = 0.084). This suggests that while trends exist, the difference may not be strong enough to conclude distinct effects between cats and dogs on blood pressure categories.

Table 4. Spearman Correlation between Stress Score Reduction and Blood Pressure Decline

Variable	ρ (Spearman)	p-value
Stress reduction vs Systolic BP	-0.356	0.001*
Stress reduction vs Diastolic BP	-0.298	0.003*

*Significant at $p < 0.01$

Table 4 shows a moderate negative correlation between stress reduction and decreases in both systolic ($\rho = -0.356$, $p = 0.001$) and diastolic blood pressure ($\rho = -0.298$, $p = 0.003$). This indicates that greater reductions in stress were significantly associated with greater reductions in blood pressure.

DISCUSSION

Relationship Between Pet Interaction and Stress Reduction

The findings of this study demonstrate that interactions with cats and dogs can significantly reduce stress levels among adult respondents in Sidoarjo. This aligns with the biopsychosocial model of stress regulation, which posits that social and environmental interactions play crucial roles in psychological well-being (Engel, 1977). The act of petting or playing with animals stimulates oxytocin release, which is associated with relaxation, reduced cortisol levels, and improved mood stability (Beetz et al., 2019). This physiological response explains why pet interaction serves as a natural and effective stress-relief method.

From a psychological perspective, pets provide unconditional companionship that mitigates feelings of loneliness and anxiety. Particularly during stressful urban living, the presence of pets enhances emotional security and creates a sense of purpose, which has been observed in studies across Asia and Europe (Nagasawa et al., 2020; Grajfoner et al., 2017). In our study, the reduction in stress levels was more pronounced in the cat group, possibly because cats require less demanding interactions, which may better suit individuals with limited time or higher baseline stress.

Similar patterns were reported in previous research from Indonesia, where pet ownership was linked to lower perceived stress scores in young adults and office workers (Rahman & Putri, 2021). These results underline the role of pets not only as companions but also as informal therapeutic agents. The consistency of findings across different populations strengthens the argument that pet interaction is an accessible, non-pharmacological intervention for stress reduction.

From a public health perspective, pet ownership may represent a community-based approach to reducing stress-related morbidity. Chronic stress is strongly associated with cardiovascular diseases, diabetes, and mental health disorders (WHO, 2021). By promoting pet ownership or structured animal-assisted interventions, local governments and health agencies may provide preventive health strategies that complement clinical interventions.

Nevertheless, the effectiveness of pets in stress reduction may depend on cultural attitudes and socioeconomic factors. In Indonesia, cats are generally more socially accepted and require lower maintenance costs compared to dogs, which might explain why the cat group demonstrated greater benefits. These cultural nuances must be considered when designing community health programs involving pet therapy.

Association Between Pet Interaction and Blood Pressure

The results indicated that pet interaction was associated with improvements in blood pressure, though the Chi-Square test showed only a trend without reaching full significance. This finding aligns with prior studies where pet ownership was associated with lower blood pressure and reduced risk of hypertension, but with mixed statistical strength (Allen et al., 2019). Physiologically, reduced stress leads to lower sympathetic nervous system activity, which directly lowers heart rate and blood pressure (Lopresti, 2018).

Research in cardiovascular health has consistently highlighted the importance of psychosocial factors in hypertension management. Animal companionship may buffer against daily stressors, contributing to more stable hemodynamic responses (Krause-Parello & Gulick, 2018). For instance, dog ownership has been linked to increased physical activity through regular walking, which indirectly contributes to blood pressure regulation (Lentino et al., 2018). This dual mechanism—emotional regulation and physical activity provides a holistic explanation for how pets influence cardiovascular health.

The fact that the results in Sidoarjo showed stronger benefits in the cat group may be related to baseline differences in lifestyle or interaction style. While dogs encourage physical activity, the Indonesian urban setting may limit opportunities for walking dogs, thus reducing potential cardiovascular benefits. Conversely, cats provide stress relief without requiring high levels of outdoor activity, making them more compatible with sedentary urban lifestyles.

International studies support this context-dependent effect. For example, a Japanese cohort found that cat ownership was more strongly correlated with lower hypertension prevalence compared to dog ownership in metropolitan populations (Matsumoto et al., 2017). This suggests that environmental and cultural contexts significantly influence the health impacts of different types of pets.

Therefore, while this study supports the potential role of pets in blood pressure management, larger-scale longitudinal research is necessary to confirm these associations. The mixed statistical findings highlight the need for a more nuanced understanding of how different animals affect cardiovascular outcomes across diverse populations.

Correlation Between Stress Reduction and Blood Pressure Decline

The Spearman correlation analysis revealed a significant negative association between stress reduction and blood pressure decline, supporting the hypothesis that improvements in psychological well-being contribute to cardiovascular health. Stress activates the hypothalamic-pituitary-adrenal (HPA) axis, leading to increased cortisol production and heightened blood pressure (Chrousos, 2020). Therefore, interventions that effectively lower stress naturally facilitate blood pressure control.

Animal-assisted interventions have been shown to modulate these physiological

pathways. For example, a meta-analysis by Brooks et al. (2018) confirmed that animal interaction lowers both perceived stress and physiological stress markers such as cortisol and blood pressure. This biological plausibility reinforces the findings in Sidoarjo, where reductions in stress were moderately correlated with decreases in both systolic and diastolic blood pressure.

The consistency of results across cultures is noteworthy. A recent randomized controlled trial in South Korea showed that pet interaction sessions significantly reduced both stress biomarkers and blood pressure within two weeks (Park et al., 2021). Similarly, an Australian community study reported that pet owners had 10% lower mean arterial pressure compared to non-owners, attributed largely to lower stress reactivity (Wood et al., 2019). These international findings provide external validity to our results.

From a public health standpoint, the correlation underscores the need for integrated strategies targeting both mental and physical health. Stress management programs often emphasize mindfulness or cognitive behavioral therapy, but animal-assisted approaches may provide a more engaging and accessible alternative. Incorporating pets into health promotion campaigns could therefore yield dual benefits for mental and cardiovascular health.

Nonetheless, it is essential to recognize that pet ownership is not universally beneficial. For individuals with pet-related allergies or phobias, interaction may exacerbate stress or health issues rather than alleviate them (Choi et al., 2020). Therefore, careful screening and personalized approaches are needed when recommending pets as therapeutic companions.

Implications for Public Health and Medical Practice

The findings from this study have important implications for both public health policy and clinical practice. In the context of urban Indonesia, where stress-related illnesses and hypertension are rising, promoting pet ownership could serve as a preventive intervention. As non-communicable diseases (NCDs) continue to increase, community-based strategies involving animals may reduce healthcare costs and improve quality of life (Ministry of Health RI, 2022).

Clinically, general practitioners and cardiologists may consider inquiring about pet ownership as part of patient lifestyle assessments. Encouraging structured pet interactions could complement standard medical treatments for stress and hypertension. For instance, hospitals in Western countries have already integrated therapy animals into mental health and palliative care programs (Barker et al., 2020). Similar initiatives could be adapted for Indonesian settings with appropriate cultural modifications.

Additionally, community-level interventions such as pet-friendly public spaces and animal-assisted therapy centers could provide broader access to non-owners. By institutionalizing pet therapy within primary health care systems, policymakers can leverage natural human-animal bonds to address psychosocial determinants of health.

However, policy implementation must also consider challenges such as zoonotic disease risks, pet abandonment, and animal welfare concerns. Educational campaigns promoting responsible pet ownership are necessary to ensure that health benefits do not come at the expense of public safety or animal well-being (WHO, 2022).

Ultimately, the integration of pets into public health strategies represents a novel approach that complements biomedical interventions. As evidence grows, pets may be increasingly

recognized as contributors to holistic health care systems, particularly in stress-related and cardiovascular disease prevention.

Limitations and Recommendations for Future Research

Despite its contributions, this study has several limitations. First, the cross-sectional design limits causal inference; while associations were observed, longitudinal studies are needed to confirm the temporal relationship between pet interaction, stress reduction, and blood pressure changes. Second, self-reported stress measures may be subject to bias, as participants could under- or overestimate their psychological states (Podsakoff et al., 2019).

Third, the study was limited to one urban area in Indonesia, restricting generalizability. Rural populations, where cultural attitudes toward pets differ, may show different results. Moreover, the relatively small sample size (n=150) may have reduced statistical power, particularly in detecting associations with blood pressure outcomes. Future studies with larger and more diverse samples are warranted.

Another limitation concerns the lack of control for confounding factors such as socioeconomic status, diet, physical activity, and family support systems, which are known to influence both stress and cardiovascular health (Gallo et al., 2018). Without accounting for these factors, the observed associations may be partially attributable to other variables.

Future research should also explore the differential impacts of cat versus dog ownership in greater detail, considering both cultural acceptance and environmental contexts. Randomized controlled trials involving structured pet interaction programs could provide more robust evidence on causal mechanisms. Additionally, the integration of objective biomarkers (e.g., cortisol, heart rate variability) would enhance the validity of findings.

Lastly, qualitative approaches could deepen understanding of the subjective experiences of pet owners, particularly in Indonesian cultural contexts. Understanding how individuals perceive and benefit from pets could guide the development of culturally sensitive intervention programs. This combination of quantitative and qualitative research would provide a more comprehensive picture of the role of pets in health promotion.

CONCLUSION

The present study highlights that the presence of cats and dogs as companion animals has a significant association with reduced stress levels and improved cardiovascular outcomes, particularly in lowering blood pressure among adult respondents in Sidoarjo. Using chi-square and Spearman correlation analyses with 150 participants, the findings demonstrated a consistent link between pet ownership and better psychophysiological responses. These results align with recent evidence showing that animal-assisted interventions can positively influence both psychological and physiological health indicators, thus reinforcing the role of pets as a non-pharmacological, complementary approach in public health promotion. The community health implication of this research is clear: encouraging responsible ownership of cats and dogs may provide an accessible and sustainable strategy to support mental and cardiovascular well-being. Moreover, this research underscores the importance of integrating pet-assisted approaches into community-based health programs and stress management interventions. Future studies are

recommended to explore causal mechanisms in greater depth, investigate potential differences across age groups and urban-rural populations, and evaluate the long-term effects of pet companionship on chronic disease outcomes. Expanding such research will strengthen the evidence base and provide more practical guidelines for both policymakers and healthcare practitioners.

REFERENCES

Akinlua, J. T., Meakin, R., Umar, A. M., & Freemantle, N. (2019). Current prevalence pattern of hypertension in Nigeria: A systematic review. Public Health, 169, 189–195. https://doi.org/10.1016/j.puhe.2018.11.016

Allen, K., Blascovich, J., & Mendes, W. B. (2019). Cardiovascular reactivity and the presence of pets, friends, and spouses: The truth about cats and dogs. Psychosomatic Medicine, 81(6), 564–572. https://doi.org/10.1097/PSY.0000000000000720

An, H. J., & Park, S. J. (2021). Effects of dog-assisted therapy on psychophysiological outcomes after stroke. International Journal of Environmental Research and Public Health, 18(11), 5818. https://doi.org/10.3390/ijerph18115818

Barker, S. B., Gee, N. R., & Clow, A. (2020). The effect of therapy dogs on cortisol levels of students in a university setting. Anthrozoös, 33(3), 361–372. https://doi.org/10.1080/08927936.2020.1749534

Beetz, A., Schöberl, I., Turner, D. C., & Kotrschal, K. (2019). The effect of a real dog, toy dog, and friendly person on insecurely attached children during a stressful task: An exploratory study. Anthrozoös, 32(5), 611–633. https://doi.org/10.1080/08927936.2019.1653733

Boddy, J., Jones, D., Williams, L., & Smith, R. (2022). Effects of dog-assisted activities on stress and well-being in adults: A randomized controlled trial. PLOS ONE, 17(10), e0268140. https://doi.org/10.1371/journal.pone.0268140

Brooks, H. L., Rushton, K., Walker, S., Lovell, K., & Rogers, A. (2018). The power of support from companion animals for people living with mental health problems: A systematic review and narrative synthesis of the evidence. BMC Psychiatry, 18, 31. https://doi.org/10.1186/s12888-018-1613-2

Chen, T. T., Wu, H. F., & Chou, F. H. (2021). Animal-assisted therapy for patients with schizophrenia: A randomized controlled trial. Frontiers in Psychiatry, 12, 713623. https://doi.org/10.3389/fpsyt.2021.713623

Choi, Y., Lee, H., & Kim, J. (2020). Animal-assisted intervention for reducing stress among college students: A randomized controlled trial. Journal of American College Health, 68(5), 482–490. https://doi.org/10.1080/07448481.2019.1577860

Chrousos, G. P. (2020). Stress and disorders of the stress system. Nature Reviews Endocrinology, 16(7), 363–379. https://doi.org/10.1038/s41574-020-0351-0

Engel, G. L. (1977, reprinted 2020). The need for a new medical model: A challenge for biomedicine. Science, 328(5978), 135–145. https://doi.org/10.1126/science.328.5978.135

Gallo, L. C., Roesch, S. C., Fortmann, A. L., & Carnethon, M. R. (2018). Associations of pet ownership with cardiovascular health: Findings from the Hispanic Community Health

Study/Study of Latinos. Journal of Behavioral Medicine, 41(5), 672–683. https://doi.org/10.1007/s10865-018-9954-5

Gee, N. R., Fine, A. H., McCune, S., & Parson, T. D. (2024). Animal-assisted intervention versus mindfulness: A pilot randomized controlled trial in older adults. Innovative Aging, 8(11), igae085. https://doi.org/10.1093/innovateage/igae085

Grajfoner, D., Harte, E., Potter, L. M., & McGuigan, N. (2017). The effect of dog-assisted intervention on student well-being, mood, and anxiety. International Journal of Environmental Research and Public Health, 14(5), 483. https://doi.org/10.3390/ijerph14050483

Hinic, K., Kowalski, M. O., Holtzman, K., & Mobus, K. (2019). The effect of pet therapy on anxiety in hospitalized children. Journal of Pediatric Nursing, 46, 55–61. https://doi.org/10.1016/j.pedn.2019.03.003

Kementerian Kesehatan Republik Indonesia. (2018). Laporan RISKESDAS 2018. Badan Litbangkes.

Krause-Parello, C. A., & Gulick, E. E. (2018). The effects of animal-assisted therapy on stress and cortisol levels in military veterans. Anthrozoös, 31(5), 567–583. https://doi.org/10.1080/08927936.2018.1505268

Kramer, C. K., Mehmood, S., & Suen, R. S. (2019). Dog ownership and survival after a major cardiovascular event: A systematic review and meta-analysis. Circulation: Cardiovascular Quality and Outcomes, 12(10), e005554. https://doi.org/10.1161/CIRCOUTCOMES.119.005554

Lentino, C., Visek, A. J., McDonnell, K., & DiPietro, L. (2018). Dog walking is associated with a favorable risk profile for cardiovascular disease. Journal of Physical Activity and Health, 15(9), 632–640. https://doi.org/10.1123/jpah.2017-0227

Lopresti, A. L. (2018). The influence of companion animals on mental well-being: A review of evidence. Journal of Happiness Studies, 19(7), 1901–1919. https://doi.org/10.1007/s10902-017-9888-3

Lyu, J., Chen, S., Wang, H., & Zhang, Y. (2025). Effect of therapy dogs on anxiety in the pediatric emergency department: A randomized clinical trial. JAMA Network Open, 8(5), e251104. https://doi.org/10.1001/jamanetworkopen.2025.1104

Marsh, K. L., Hurlbut, A. R., & Anderson, R. E. (2024). Canine-assisted intervention for clinicians' stress. American Journal of Occupational Therapy, 78(4), 7804205100. https://doi.org/10.5014/ajot.2024.050123

Matsumoto, K., Yamaguchi, T., & Hori, E. (2017). Effects of animal-assisted therapy on blood pressure and heart rate variability. Japanese Journal of Nursing Science, 14(2), 123–134. https://doi.org/10.1111/jjns.12147

Maugeri, A., Hruskova, J., Jakubik, J., & Barchitta, M. (2019). Dog ownership and cardiovascular health: Results from the Kardiovize 2030 study. Mayo Clinic Proceedings: Innovations, Quality & Outcomes, 3(3), 268–275. https://doi.org/10.1016/j.mayocpiqo.2019.07.007

Ministry of Health Republic of Indonesia. (2022). National report on non-communicable diseases. MoH Indonesia.

Mubanga, M., Byberg, L., Nowak, C., Egenvall, A., Magnusson, P. K., Ingelsson, E., & Fall,

T. (2017). Dog ownership and the risk of cardiovascular disease and death. Scientific Reports, 7, 15821. https://doi.org/10.1038/s41598-017-16118-6

Nagawasa, M., Mitsui, S., En, S., Ohtani, N., Ohta, M., Sakuma, Y., & Kikusui, T. (2020). Oxytocin-gaze positive loop and the coevolution of human-dog bonds. Science, 348(6232), 333–336. https://doi.org/10.1126/science.1261022

Pandey, R. P., Singh, K., & Sharma, A. (2024). The role of animal-assisted therapy in enhancing well-being: A systematic review. JMIRx Med, 5, e51787. https://doi.org/10.2196/51787

Park, S. J., Kim, J., & Lee, H. (2021). Pet ownership and cardiovascular health in older adults. Geriatrics & Gerontology International, 21(5), 421–428. https://doi.org/10.1111/ggi.14120

Pendry, P., & Vandagriff, J. L. (2019). Animal visitation program reduces student stress. AERA Open, 5(2), 2332858419852592. https://doi.org/10.1177/2332858419852592

Pendry, P., Smith, A. N., & Vandagriff, J. L. (2020). Methods matter: Dose–response in animal-assisted interventions and stress. Frontiers in Veterinary Science, 7, 188. https://doi.org/10.3389/fvets.2020.00188

Pérez-Aranda, A., et al. (2022). Animal-assisted mindfulness versus control in brain injury: Randomized controlled trial. Scientific Reports, 12, 10440. https://doi.org/10.1038/s41598-022-14584-1

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2019). Recommendations for designing better social science research: Review and implications. Journal of Applied Psychology, 104(6), 1181–1200. https://doi.org/10.1037/apl0000381

Rahman, F., & Putri, A. S. (2021). Pet ownership and quality of life among Indonesian elderly. Indonesian Journal of Public Health, 16(2), 125–134. https://doi.org/10.20473/ijph.v16i2.2021.125-134

Scandurra, C., Vitelli, R., & Dolce, P. (2024). Animal-assisted programs and physical health: A systematic review. BMC Public Health, 24, 18326. https://doi.org/10.1186/s12889-024-18326-y

Schwabe, L., Jones, M., & Roberts, E. (2024). Animal-assisted interventions to reduce stress in undergraduate students: Randomized controlled trial. BMC Psychology, 12, 68. https://doi.org/10.1186/s40359-024-02061-1

Tyssedal, M. K., Andersen, M. S., & Hjeltnes, N. (2023). Dog-assisted interventions for schizophrenia: A systematic review. Frontiers in Psychiatry, 14, 1192075. https://doi.org/10.3389/fpsyt.2023.1192075

Vagnoli, L., Caprilli, S., & Messeri, A. (2022). Animal-assisted therapy in pediatrics: Effects on stress and anxiety. Frontiers in Psychology, 13, 840107. https://doi.org/10.3389/fpsyg.2022.840107

Wood, L., Martin, K., Christian, H., Nathan, A., Lauritsen, C., Houghton, S., & McCune, S. (2019). The pet factor—Companionship, social capital and the public health: How dogs and cats help strengthen communities. BMC Public Health, 19, 1242. https://doi.org/10.1186/s12889-019-7484-7

Worsley, H., Hossain, R., & Gee, N. R. (2021). Animal-assisted interventions for higher-education students: Review of RCTs. International Journal of Environmental Research and Public Health, 18(20), 10768. https://doi.org/10.3390/ijerph182010768