



Dogs at home and at the workplace: effects on allergies and mental health

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Received: 25 April 2023 / Accepted: 29 May 2023 / Published online: 30 June 2023
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Summary Since the beginning of domestication, the living conditions which are shared between humans and companion animals have changed dramatically. More time is spent together indoors, not only in urban places, but also in rural areas. Among the positive aspects is the asthma- and allergy-protective effect of living with pets during fetal development and infancy. In addition, there are benefits in terms of social interactions and mental health for humans and, as far as can be assessed, also for companion animals. Animals, especially dogs, are also brought more often to workplaces and schools. Thus, a number of the positive effects on social and health aspects are likely to come to these places of activity as well. Optimal preparation of the workplace for the animal by the owner, as well as instruction of employees and, additionally, training of the animal could help reduce potentially adverse effects. Such negative effects could include interference with work processes

(phone calls, meetings, lectures, sales calls), and fear of bites or accident hazards by colleagues. In the sense of a One Health approach, this article focuses on the importance of animals (especially dogs) and humans sharing the home, but also the workplace. The effects on allergic/asthmatic diseases as well as on social and mental factors are particularly highlighted, as the latter may also contribute to these diseases. Only a few studies have examined the effects of contact between adult people, who are not pet owners themselves, with dogs in the work environment; so there is clearly a need for further research.

Keywords Asthma · Atopy · Cohesion · Sensitization · Stress

Introduction

Asthma and allergic diseases have increased in the last 3–5 decades [1]. In the adult population, the prevalence for asthma is currently 11.2% (of which 52% are classified as allergic asthma) and for allergic rhinitis 29.4% (mean worldwide) [1, 2]. Also our companion animals suffer from allergies and hypersensitivities, for example, among dogs about 25% are affected by pollen allergies [3, 4].

Regarding allergies to pets *per se*, a recently published study states that among school children 3.2–4.7% were sensitized to dogs [5].

Animals can also be sensitized or allergic to other animal species and even to their human partners: 27% of about 600 dogs tested intradermally were positive to cat dander, and 31.4% to human dander [6].

In a One Health approach, it is acknowledged that multiple factors such as environmental pollution (increased allergenicity of proteins, higher lung burden), processed human and animal foods, decreased contact with natural environments (decreased micro-

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biome diversity) and insufficient exercise (obesity) can influence disease development and asthma and allergy progression [7].

This article addresses the impact of human–animal interactions (especially with dogs) on physical and mental health. It also highlights the trend of bringing dogs to workplaces such as offices or universities, which has even been celebrated since 1999 with a dedicated “National Take Your Dog to Work Day” (this year June 23, 2023).

Pet ownership—effects on childhood asthma and allergies

Contact with domestic and farm animals very early in life may reduce the development of asthma and allergies in humans [8–10]. Apparently, living with many and different pets in the first year of life has a protective effect on the development of asthma and allergies, such as allergic rhinoconjunctivitis or eczema [11]. The preventive effect even seems to be dose-dependent: an inverse relationship is shown between the number of dogs and cats living in the household in the first year of a child’s life with the development of allergies at the age of 7–9 years. Here, no children with 5 or more pets had “allergy ever”, whereas “allergy ever” or “sensitization to animals and pollen” was reported for almost half of the children (49%) without pets. Contact with dogs (and cats) also appears to be protective against the development of food allergies when it occurs during fetal development and/or early infancy: living with dogs was associated with a 90% reduction in the risk of food allergies, particularly to egg, milk, and nuts (exposure to cats resulted in lower allergy to egg, wheat, and soybeans) [12]. A dose-dependent effect was also observed, as no child with contact to two or more dogs showed food allergies. It is believed that the protective effect is mediated by animals via alteration of the human microbiome. Contact with many animal individuals and different species probably increases the diversity of the gut microbiota of children, as has been shown with dogs [13], and thus contributes to allergy prevention. In addition, there is also an exchange of the skin microbiome between owners and animals (dogs, hand-reared wolves) [14, 15]. Accordingly, individuals share more skin microbiota with their own dogs than with foreign dogs. Whether this is a transient effect (e.g., due to cuddling, petting) and also affects the health status of owner and/or animal remains to be determined.

Contact with dogs may to some extent also compensate a genetic predisposition for the development of respiratory diseases: individuals who carry a particular allele (rs2305480 G) have an increased risk of consistent wheezing (whistling breathing sound, primarily on exhalation), and this risk is reduced when such individuals have a dog in their household [16]. A recent meta-analysis that included studies of more

than 77,000 children from nine birth cohorts in Europe examined the risk of school-age asthma when living with pets [5]. It showed that owning dogs and cats in early childhood did not increase the risk of school-age asthma or pet-specific allergic sensitization. On the other hand, if specific allergic sensitization to dogs (or cats) already existed, the risk for school-age asthma also increased. Apparently, this risk is further increased if a dog (or cat) actually lives in the household with these sensitized children. It is noteworthy in this context that many sensitized and also allergic patients do not avoid contact with their pet: in a subcohort of 2470 evaluated individuals, 17 were dog-sensitized individuals still having their own dog [5].

Recommendations are given in the current S3 guideline on allergy prevention: for families without obvious allergy risk, no restriction on pet ownership of dogs (or cats) is necessary, whereas families with increased allergy risk or with children who already have atopic/allergic disease should not acquire cats, but dog ownership should not be discouraged [17]. Whether dog ownership can be proactively recommended as primary allergy prevention for families needs to be clarified in controlled studies.

Pet ownership—impact on asthma and allergies in adulthood

Most of the above studies have focused on the impact of pet ownership during fetal development and early childhood, and on the development of asthma and allergies up to a maximum of 13 years of age. Whether pet ownership can influence asthma/allergies and other noncommunicable diseases in adulthood has scarcely been studied. A New Zealand study compared exposure to dogs/cats in childhood (between birth and age 9 years) with that in adulthood (18–32 years) [18]. This showed that children who owned both a dog and a cat were less likely to be sensitized at age 13 (positive reactions in the skin test) than those with only one animal or no animal contact. However, adults who were not sensitized (no skin test reactions) at age 13 and did own both a dog and a cat starting at age 18 also had fewer skin test reactions at age 32. The group with a family/parental history of skin test reactions particularly benefited from this contact. This protective effect of living with pets was also observed in adults only when both a dog and a cat were in the household.

A Japanese study observing adults up to age 48 years found that 5.7% of dog owners compared with 14.8% of non-dog owners (and 5.6% of cat owners compared with 13.5% of non-cat owners) developed asthma [19]. In this regard, dogs were protective against asthma when contact occurred early in life (whereas the protective effect of cats appeared to exist across all age groups). It should be noted that the housing conditions of animals in Japan (animals

spend a lot of time indoors, small living space) are probably not comparable to those in other cities/countries.

Pet ownership in adults with asthma and allergies

Most studies suggest an early window (fetal development and before age 18) for the preventive potential of pet ownership. However, this does not necessarily mean that allergies will develop if pet contact occurs later in life.

A Korean study, conducted at a pet show among adults with dogs and/or cats (average age 30 years, predominantly female) investigated the presence of allergies (by questionnaire and skin test) and correlated it with other factors such as number of animals, contact time, hygiene measures, etc. [20]. Among the surveyed dog owners, about 25.3% suffered from (reported) dog allergy, and 16% of all persons with a dog in the household tested positive for dog in the skin test. Comparing allergic to non-allergic owners, the only difference was that allergic individuals with dogs had kept their pets longer (7.3 years compared to 5.6 years for non-allergic). Other factors such as the number of pets (current and cumulative over a lifetime), lifestyle and hygiene measures (such as shaving the pet, cleaning the bed, pet sleeping in the owner's bed), age of the adult respondent, and contact time with dog did not correlate with the development of allergy to the pet.

In contrast to patients with *allergies*, adults with *non-allergic asthma* had higher current and childhood exposure to dogs and cats than healthy controls [21]. Also, in these asthma sufferers, allergy parameters (positive skin prick test and IgE to common aeroallergens) were not associated with current pet ownership. Early childhood pet ownership also protected asthmatic adults from sensitization (positive skin test reactions). However, another research group showed that asthma patients (not explicitly tested for allergies) were 3.63 times more likely to have an asthma attack if they kept a pet (dog, cat, or both) than those without pets [22].

It remains to be clarified whether the findings on preventive effects or allergic symptomatology in adults can also be transferred to contact between animals and employees at the workplace, i.e., coworkers who do not have companion animals themselves.

Dogs in the workplace—impact on human mental health

Although it is currently unclear whether and how contact with pets in the workplace contributes to development or progression of allergies and asthma in (fellow) workers, bringing dogs to the workplace is widely encouraged. Employers and employees alike believe that dogs improve the social climate [23, 24], even though

allergies and fear of dogs are seen as potential drawbacks. In fact, the social support function of dogs in therapeutic and everyday situations is relatively well documented [25, 26]. Many factors that are positively influenced by living with dogs, such as stress levels, exercise, and activity, and thus possibly body weight, may end up having an indirect effect on the development of asthma and allergies. Whether and to what extent these benefits can be transferred to the work environment has only recently started to be investigated.

To our knowledge, there have been only two quantitative studies on the effects of dogs on mental health in the workplace. Barker et al. found that those who brought their dog to work had the lowest stress levels. This is important because stress could have a negative impact on individuals with asthma. Those who owned a dog but did not bring it to work had the highest stress scores [27]. This suggests that reducing the hours where a dog is alone at home could be beneficial to owners. Hall and Mills found that for individuals who brought their dog to work, energy, engagement, work performance, work-related quality of life, and workplace friendships were stronger and intention-to-quit was lower than for employees who did not bring their own dog to work [28].

Qualitative studies have also examined perceptions of, and barriers to, pets in the workplace. Surveys of office workers have generally found more advantages than disadvantages of bringing a dog to work [29]. Commonly cited benefits include improved mood [29], social interaction/communication and less stress [23, 29, 30], sociability (for owner, coworkers, and dog), and social cohesion [30]. In the university setting, staff and students cite improved communication, social skills, and stress reduction as benefits, but acknowledge that not all colleagues agree [31].

In one experimental setting, the presence of a dog in a group problem-solving task was found to increase verbal cohesion, cooperation, and physical closeness, but not verbal closeness, interpersonal trust, or satisfaction among group members [32]. Another study examined the effect of the presence of a dog along with the difficulty of a problem-solving task under time pressure, on participants' stress levels (with-out or with their own dog) [33]. It was shown that the mere presence of an accompanying animal was not sufficient to reduce stress in all participants, but that the stress level depended both on the difficulty of the task and on whether the person was a dog owner or not: those with their own dog benefited more—presumably because of their principally positive attitude towards dogs. It was also found that, based on photographs, both clientele and staff perceived the atmosphere in offices with cats or dogs to be more positive than those without animals [34]. Similarly, based on a photograph of a professor's office, the professor was perceived by observers as friendlier and less busy when a dog was present than

when a cat or no animal was present [35]. Perceptions were not influenced by existing allergies or general attitudes toward dogs/cats.

Physical exercise has also been cited as a possible benefit of having dogs in the workplace [29]. For example, lunchtime walks with shelter dogs were found to improve the mood of university employees [36].

In summary, most studies suggest that the mere presence of a dog has a positive effect on people's perceptions of the workplace, interactions, stress management, and possibly physical activity.

Obviously, a prerequisite for the impact to be positive is a workplace that is prepared in the best possible way. It is necessary to create a safe resting place for the dog (e.g., a bed under the desk of the owner) where the animal can retreat if it feels threatened by strangers. Such an arrangement can also minimize safety risks: if the dog bed is placed in an ideal location and at a greater distance from other people in the room, the risk of tripping over the dog, its toys or its leash decreases. Owners can additionally ask coworkers and people foreign to the office not to approach or call the dog, and also train their dog not to initiate interactions with others. This will also make bites and other contact-induced health problems less likely [37].

No study to date has examined to which extent the interaction-promoting and stress-reducing effects of dogs on people depend on the actual behavior of the dogs. Rather, all experimental studies demonstrating the positive effects of the presence of dogs included either trained assistance animals or dogs that reliably exhibited friendly and calm behavior in response to attention from strangers [32, 33]. When dogs are not properly socialized and trained to be in an office, or are not adequately cared for during working hours, they express their stress through their behav-

ior (whining, frequent shaking, scratching, and yawning) [38]. Additionally, dogs can forcefully empty their anal glands, and therefore communicate their stress through olfactory channels [39]. Odor could serve as an "alarm pheromone" in an intraspecific context (i.e., for communication between dogs) [40], but it is also perceived as unpleasant by humans [41]. Therefore, stressed dogs could increase the stress level of colleagues in the room/office through their behavior and smell. Consequently, it is in the interest of all parties involved—dogs, dog owners, coworkers—to provide conditions for the dog to relax and feel comfortable.

If the dogs are well socialized and the staff is appropriately informed, an important step for the dog's well-being may also be to facilitate interactions with interested humans. In contrast to experimental studies examining the effects of passive dogs on people's stress management and cooperative problem solving, when asked about real-life situations, individuals are more likely to recall active situations: they report negative effects when a dog actively distracts them, and positive feelings during affiliative interactions, such as when a dog greets them, plays with them, or the dog actively seeks physical contact with them [29]. Therefore, actual interactions and contact between dogs and people in the workplace likely contribute to the positive effects dogs can have on employees' psychological well-being.

As mentioned earlier, such contact does not appear to increase the risk of developing allergies or asthma in healthy adults. Of course, if there are employees who are already allergic to the species in question, contact should be avoided and, depending on the given conditions of the building, the animal and owner may need to be located in an office separated from the allergic person.

Fig. 1 Animals are also permanent members of the team meetings of Comparative Cognition Research, Comparative Medicine and Ethics and Human-Animal Studies at the Messerli Research Institute. There are many opportunities for mutual interactions and transmissions between animals and workers in the workplace that can impact the physical and mental health of both parties. The impact can be positive (gray) or negative (orange), which also depends on individual factors of all participants. (©Viranyi/VetMedUni Vienna [used with permission of all involved])



Whether and to what extent dogs have a positive effect on the physical and mental health of employees who do not have a dog themselves also depends on the attitude of those people and the behavior of the dogs [29]. Contextual factors important to the success of dogs in the workplace include addressing problems openly, tolerating mistakes by both owners and dogs, discussing solutions with a subsequent trial phase, and allowing employees flexibility during breaks [30].

Summary

Contact with companion animals such as dogs could have a positive effect on human physical and mental health, and in many cases, dogs being present at the workplace could have the same effect. The benefits of companion animals are probably not transferable to all workplaces (see [42]). The workplace must be set up appropriately to address health and safety concerns, as well as existing allergies or fears of coworkers (Fig. 1). However, dog-friendly workplaces may be perceived as more attractive than those without animals [43], and there is good evidence that dogs in office or university environments can provide mental and physical health benefits for all involved (Fig. 1).

Whether the risk of asthmatic or allergic diseases at work increases for colleagues (without own animals) or, on the contrary, even a protective effect may occur (e.g., through less stress, higher socialization, possibly a little more physical exercise during walks with the dog, transfer and thus enrichment of microbiota that could lead to allergy protection) remains to be clarified in future studies (Table 1).

Acknowledgements Research during the preparation of this article was supported by projects DARC#8 (Karl Landsteiner University, Krems, Austria), and ARED FFLF MR/T042249/1 (UK Research and Innovation, UKRI).

Funding Open access funding provided by Medical University of Vienna.

Conflict of interest I. Pali-Schöll, R. Dale and Z. Virányi declare that they have no competing interests.

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References

1. Savoure M, Bousquet J, Jaakkola JJK, Jaakkola MS, Jacquemin B, Nadif R. Worldwide prevalence of rhinitis in adults: a review of definitions and temporal evolution. *Clin Transl Allergy*. 2022;12(3):e12130.
2. Pakkasela J, Ilmarinen P, Honkamaki J, Tuomisto LE, Andersen H, Piiirila P, et al. Age-specific incidence of allergic and non-allergic asthma. *BMC Pulm Med*. 2020;20(1):9.
3. Mueller RS, Bettenay SV, Tideman L. Aero-allergens in canine atopic dermatitis in southeastern Australia based on 1000 intradermal skin tests. *Aust Vet J*. 2000;78(6):392–9.
4. Jensen-Jarolim E, Einhorn L, Herrmann I, Thalhammer JG, Panakova L. Pollen allergies in humans and their dogs, cats and horses: differences and similarities. *Clin Transl Allergy*. 2015;5:15.
5. Pinot de Moira A, Strandberg-Larsen K, Bishop T, Pedersen M, Avraam D, Cadman T, et al. Associations of early-life pet ownership with asthma and allergic sensitization: a meta-analysis of more than 77,000 children from the EU child cohort network. *J Allergy Clin Immunol*. 2022;150(1):82–92.
6. Tarpatki N, Papa K, Reiczigel J, Vajdovich P, Vorosi K. Prevalence and features of canine atopic dermatitis in Hungary. *Acta Vet Hung*. 2006;54(3):353–66.
7. Pali-Schöll I, Roth-Walter F, Jensen-Jarolim E. One health in allergology: a concept that connects humans, animals, plants, and the environment. *Allergy*. 2021;76(8):2630–3.

Table 1 Knowledge gaps and future research

Open questions	Comments
Can contact with dogs and other animals also contribute to the <i>prevention</i> of allergies and asthma at an older age, when people are in professional life? Is there also an influence on colleagues who do not keep dogs themselves?	Living with dogs and cats has a preventive effect on asthma and allergy development, especially when contact occurs during fetal development and early life (before age 13–18); it is not known whether contact with dogs and/or other animals in <i>adulthood</i> is also protective.
Does the presence of an animal in the workplace pose a risk for other employees to <i>develop asthma or allergies</i> ?	It is not known whether contact with animals in adulthood can lead to increased risk of allergy or asthma development.
Does the mutual exchange of the microbiome also influence the health of the pets?	It is not known whether in case of illness (e.g., atopic dermatitis) the altered microbiome of the owner's/coworker's skin could be transferred to the dog and would also affect its health status.
Does the presence of a dog in the workplace lead to (i) positive physical effects in individuals without a dog (e.g., higher diversity of the microbiome)? (ii) more contact with colleagues without a dog? (iii) more physical activity by the dog owner (and possibly others in the workplace)? (iv) more, or more positive, social interactions? (v) lower stress levels of all present at the workplace?	These factors could likely have indirect effects (positive or negative) on humans and animals in terms of asthma, allergies, obesity, and related diseases.

8. Mayerhofer H, Zednik K, Pali-Scholl I. Welche Tiere wir haben und welche wir haben sollten. *AL*. 2022;45:269–78.
9. Mayerhofer H, Zednik K, Pali-Scholl I. The extended farm effect: the milk protein beta-lactoglobulin in stable dust protects against allergies. *Allergol Select*. 2022;6:111–7.
10. Pali-Scholl I, Bianchini R, Afify SM, Hofstetter G, Winkler S, Ahlers S, et al. Secretory protein beta-lactoglobulin in cattle stable dust may contribute to the allergy-protective farm effect. *Clin Transl Allergy*. 2022;12(2):e12125.
11. Hesselmar B, Hicke-Roberts A, Lundell AC, Adlerberth I, Rudin A, Saalman R, et al. Pet-keeping in early life reduces the risk of allergy in a dose-dependent fashion. *PLoS ONE*. 2018;13(12):e208472.
12. Okabe H, Hashimoto K, Yamada M, Ono T, Yaginuma K, Kume Y, et al. Associations between fetal or infancy pet exposure and food allergies: the Japan environment and children's study. *PLoS ONE*. 2023;18(3):e282725.
13. Panzer AR, Sitarik AR, Fadrosch D, Havstad SL, Jones K, Davidson B, et al. The impact of prenatal dog keeping on infant gut microbiota development. *Clin Exp Allergy*. 2023; <https://doi.org/10.1111/cea.14303>.
14. Song SJ, Lauber C, Costello EK, Lozupone CA, Humphrey G, Berg-Lyons D, et al. Cohabiting family members share microbiota with one another and with their dogs. *Elife*. 2013;2:e458.
15. Wetzels SU, Strachan CR, Conrady B, Wagner M, Burgener IA, Viranyi Z, et al. Wolves, dogs and humans in regular contact can mutually impact each other's skin microbiota. *Sci Rep*. 2021;11(1):17106.
16. Tutino M, Granell R, Curtin JA, Haider S, Fontanella S, Murray CS, et al. Dog ownership in infancy is protective for persistent wheeze in 17q21 asthma-risk carriers. *J Allergy Clin Immunol*. 2023;151(2):423–30.
17. Kopp MV, Muche-Borowski C, Abou-Dakn M, Ahrens B, Beyer K, Blumchen K, et al. S3 guideline allergy prevention. *Allergol Select*. 2022;6:61–97.
18. Mandhane PJ, Sears MR, Poulton R, Greene JM, Lou WY, Taylor DR, et al. Cats and dogs and the risk of atopy in childhood and adulthood. *J Allergy Clin Immunol*. 2009;124(4):745–750.e4.
19. Taniguchi Y, Kobayashi M. Exposure to dogs and cats and risk of asthma: a retrospective study. *PLoS ONE*. 2023;18(3):e282184.
20. Yang MS, Lee SP, Kwon YJ, Lee SM. Dog and cat allergies and allergen avoidance measures in Korean adult pet owners who participated in a pet exhibition. *Allergy Asthma Immunol Res*. 2018;10(2):155–64.
21. Oryszczyn MP, Annesi-Maesano I, Charpin D, Kauffmann F. Allergy markers in adults in relation to the timing of pet exposure: the EGEA study. *Allergy*. 2003;58(11):1136–43.
22. Megersa S, Chala G, Fikremariam K. Determinants of asthma attack among adult asthmatic patients attending at public hospitals of west Shoa zone, Oromia regional state, Ethiopia, 2021: case-control study. *J Asthma Allergy*. 2022;15:1143–54.
23. Wells M, Perrine R. Critters in the cube farm: perceived psychological and organizational effects of pets in the workplace. *J Occup Health Psychol*. 2001;6:81–7.
24. Norling A-Y, Keeling L. Owning a dog and working: a telephone survey of dog owners and employers in Sweden. *Anthrozoös*. 2010;23(2):157–71.
25. McNicholas J, Collis GM. Dogs as catalysts for social interactions: robustness of the effect. *Br J Psychol*. 2000;91(1):61–70.
26. Wood L, Giles-Corti B, Bulsara M. The pet connection: pets as a conduit for social capital? *Soc Sci Med*. 2005;61(6):1159–73.
27. Barker RT, Knisely JS, Barker SB, Cobb RK, Schubert CM. Preliminary investigation of employee's dog presence on stress and organizational perceptions. *Int J Workplace Health Manag*. 2012;5(1):15–30.
28. Hall SS, Mills DS. Taking dogs into the office: a novel strategy for promoting work engagement, commitment and quality of life. *Front Vet Sci*. 2019;6:138.
29. Hall S, Wright H, McCune S, Zulch H, Mills D. Perceptions of dogs in the workplace: the pros and the cons. *Anthrozoös*. 2017;30(2):291–305.
30. Wagner E, Pinae Cunha M. Dogs at the workplace: a multiple case study. *Animals (Basel)*. 2021;11(1):89.
31. Rambaree K, Sjöberg S. Companion Animals in Health-Promoting Work-Life. *Soc Animals*. 2019;29(1):22–40.
32. Colarelli SM, McDonald AM, Christensen MS, Honts C. A companion dog increases prosocial behavior in work groups. *Anthrozoös*. 2017;30(1):77–89.
33. Stewart A, Strickland O. A companion animal in a work simulation: the roles of task difficulty and prior companion-animal guardianship in state anxiety. *Soc Animals*. 2013;21(3):249–65.
34. Perrine RM, Wells M. Labradors to Persians: perceptions of pets in the workplace. *Anthrozoös*. 2006;19(1):65–78.
35. Wells M, Perrine R. Pets go to college: the influence of pets on students' perceptions of faculty and their offices. *Anthrozoös*. 2001;14:161–8.
36. Sartore-Baldwin ML, Baker J, Schwab L, Mahar MT, Das B. Shelter dogs, university employees, and lunchtime walks: a pilot study. *Work*. 2019;64(3):487–93.
37. Creagh K. Could your workplace be dog friendly? In: *Dog Trust*; 2022.
38. Pedretti G, Canori C, Biffi E, Marshall-Pescini S, Valsecchi P. Appeasement function of displacement behaviours? Dogs' behavioural displays exhibited towards threatening and neutral humans. *Anim Cogn*. 2023;26(3):943–52.
39. Siniscalchi M, d'Ingeo S, Minunno M, Quaranta A. Communication in dogs. *Animals (Basel)*. 2018;8(8):131; <https://doi.org/10.3390/ani8080131>.
40. Bombail V. Perception and emotions: on the relationships between stress and olfaction. *Appl Anim Behav Sci*. 2019;212:98–108.
41. Houpt KA. Domestic animal behavior for veterinarians and animal scientists. Wiley; 2018.
42. Francis LJ, Turton DW, Loudon SH. Dogs, cats and catholic parochial clergy in England and Wales: exploring the relationship between companion animals and work-related psychological health. *Ment Health Religion Cult*. 2007;10(1):47–60.
43. Wilkin CL, Fairlie P, Ezzedeen SR. Who let the dogs in? A look at pet-friendly workplaces. *Int J Workplace Health Manag*. 2016;9(1):96–109.