

Environmental Adaptions in Canine Osteoarthritis

Learning from Human Medicine

Environmental adaptation is a powerful yet underused tool in managing canine osteoarthritis (OA). Drawing from human healthcare, where home modifications are standard in the management of this chronic disease, veterinary care can be improved by addressing environmental factors that influence OA progression and expression. Despite clear benefits, it is often overlooked due to psychosocial barriers, but there is a compelling case to routinely include environmental modification in OA management strategies.

The Underappreciated Game Changer

Environmental and routine modifications are well-established in human OA care, as they are affordable, accessible and scientifically sound.

Highlights of Environmental Modification Include:

- They can have an immediate and positive impact.
- They are truly holistic approaches that address both physical and psychological well-being.
- They have the potential to slow the progression of the OA illness with emerging support that they may act as mediating factors in OA development.
- These changes are within the caregiver's control, allowing them to play an active role in the management plan, which can combat feelings of helplessness.

So why are environmental modifications not well publicised in veterinary medicine, in the same way as they are for conditions such as Feline Lower Urinary Tract Disease? Limited adoption is not simply due to a lack of awareness, with several other factors to consider:

- Environmental modifications are difficult to neatly package, feeling vague and intangible in comparison to tests or medications.
- Environmental modification plans are highly individualised, adapting to the specific needs of the dog, the caregiver and their daily routines. Explaining why environmental changes matter, teaching the key principles and helping caregivers implement them requires time that many clinicians simply don't have.
- Much like the field of occupational therapy, environmental adaptations lack robust clinical evidence (Mille, McClement & Lauer, 2023). It can be argued that their value is clear without needing extensive proof, yet without funded research these strategies struggle for legitimacy.
- Clinicians may feel that discussing the caregiver's chosen lifestyle and environment for their pet is intrusive and clinician despondency develops rapidly when clients, sold on traditional medical approaches, fail to act on advice.
- Advocacy for environmental modifications can be equally challenging within the clinic team. If one team member dismisses them as 'over the top,' it can undermine the collective belief system.

Shifting towards a more holistic approach to OA management requires not only educating caregivers but also gaining collective buy-in from the veterinary team

(Marcellin-Little, 2020). The whole team must understand the physiological, physical, emotional and cognitive consequences of chronic musculoskeletal pain.

Why Does It Matter?

Osteoarthritis is not just a disease of the joints, as it cannot be viewed in isolation of the environment that the individual lives in.

Persistent Pain

Persistent pain is all-encompassing, influencing physiology, cognition and emotion. It initiates a constant stress response, impairs brain function and affects emotional well-being (Roberts *et al.*, 2021). As seen in Figure 1, persistent pain is linked to disturbed sleep, reduced cognitive capacity, low mood, poor cardiovascular health and diminished quality of life (Smith, Mendl & Murrell, 2022). It is more than a sensory experience; it's an emotional and cognitive burden, with the inability to control or predict pain fuelling chronic stress and anxiety, which lead to heightened threat sensitivity and avoidance behaviours such as disobedience or withdrawal.

Pain fosters inactivity and altered movement patterns, which can cause muscle loss, postural changes and declining mobility (Mille, McClement & Lauer, 2023). Cognitive impairments, including reduced grey matter and neurogenesis, are exacerbated by sleep deprivation, medication and stress (Phepels, Navratilova & Porreca, 2021).

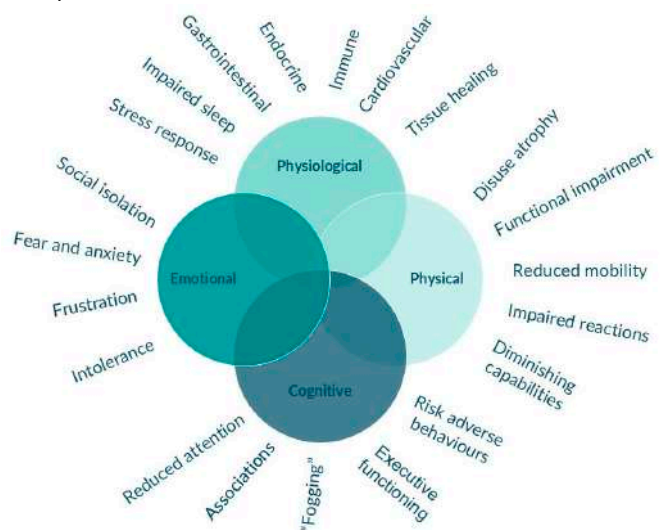


Figure 1. The consequences of living with chronic pain are extensive, impacting physiological, physical, cognitive and emotional domains

Falls

Among humans over 65, 28–35% fall annually; of these, 68% sustain injuries, 25% require medical intervention and 33% experience a functional decline afterward. Falls are linked to morbidity, hospitalisation, institutionalisation and even mortality (MDTea Podcast, 2016b). In response, robust fall-prevention strategies have been developed in human healthcare.

While bipedal humans are more biomechanically vulnerable to falls than quadrupedal dogs, many contributing

factors are shared and canines, especially those with OA and associated muscle imbalances, experience similar challenges in stability, pain and coordination (Kapatkin *et al.*, 2007; Meeson *et al.*, 2019). Though exact canine fall statistics are unavailable, the human data offers useful context.

A common misconception is that dogs' digitigrade stance, pads and claws prevent slipping. In reality, pads serve mainly to absorb force and provide sensory input, while claws only engage traction on diggable surfaces. With age, dogs' pads harden and smoothen, reducing grip and their claws are often ineffective on hard indoor floors. These age-related changes mirror human frailty, where once-manageable surfaces become hazardous.

Acute Flares

Osteoarthritis-associated pain is acute-on-chronic in nature. Persistent nociceptive signaling drives complex neuroplastic changes, leading to pain that extends beyond the site of tissue damage and a hypersensitive nervous system that is hypervigilant to further insult (Dagnall & Covey-Crump, 2023). In veterinary medicine, informal descriptions such as 'weekend warrior syndrome,' or as animals having simply 'overdone it,' are more likely acute flares of OA.

Human healthcare promotes proactive, preventive management by identifying and avoiding flare triggers, such as activities performed in the preceding 24–72 hours. Similarly recognising this 'trigger relationship,' in dogs encourages hesitant caregivers to implement necessary environmental and lifestyle modifications for their pets.

Functional Mobility Associated with OA

Pain transforms simple tasks into significant challenges. A once effortless step from the back door becomes daunting; stairs once climbed with ease turn into obstacles. Even approaching a food bowl on a tiled floor may provoke anxiety. These changes reflect the importance of functional mobility – the ability to move freely and comfortably to perform everyday activities (Wells *et al.*, 2024). Metz and Bracke (2025) stress that daily mobility is as vital for all dogs as it is for humans and Wells *et al.* (2024) have gone further and defined two categories of canine activities of daily living:

- Basic Activities for Daily Independent Mobility (BADIM): rising, moving through doorways, posturing to eliminate or eat.
- Instrumental Activities for Daily Quality of Life (IADQOL): climbing stairs, getting into a car, playing, exploring and maintaining continence.

Pain restricts both voluntary and involuntary movement. Mobility limitations often appear first in complex tasks requiring coordination, strength and motivation, while simple linear walking may remain unchanged (Wells *et al.*, 2024). Traditional veterinary assessments of impairment may be insufficient as they tend to focus on more linear outdoor activity and not complex indoor mobility, which is where dogs spend most of their time, spending on average only 30–60 minutes per day on outdoor exercise. In addition, our indoor environments are fraught with smooth floors, compact spaces and stairs far removed from a dog's natural terrain (Clark *et al.*, 2023).

Advances in available technology can provide insights into functional challenges at home and surpass our observations from in-clinic assessments, as well as highlight to the caregiver key areas of the home that need to be adapted to meet the capabilities of their dog.

Psychological Safety

Insecurity due to slippery floors, frustration from being unable to access certain areas and feelings of isolation due to limited mobility are well-recognised in humans. Dogs living in environments unsuited to their functional needs may experience persistent stress – ironically caused by the very surroundings meant to keep them safe and comfortable (Metz & Bracke, 2005; Kapatkin *et al.*, 2007).

Comorbidities

Osteoarthritis often begins in young dogs but becomes more clinically evident with age, frequently going undiagnosed until the senior years. Older dogs commonly have multiple comorbidities – up to seven organ system issues, 80% of which may be previously undetected (Davies, 2023). With this in mind, a holistic approach to OA management is essential. Age-related impairments like sensory loss, cognitive decline, cardiac or respiratory issues and sarcopenia, combined with chronic OA pain, can significantly affect a dog's physical and psychological well-being, as well as reducing mobility and increasing injury risk.

Frailty

Frailty in companion animals is an emerging concept, but well understood in human healthcare. Frailty describes a decline in physiological reserve and resilience and increasing vulnerability to adverse health events. It correlates with disability, hospitalisation, falls, surgical risks and death. Physical inactivity is a major contributor to frailty, but importantly, frailty has been shown to be reversible with exercise in humans (Bray *et al.*, 2016). Screening tools, like the frailty phenotype, aim to identify earlier loss of strength, slower walking speeds, fatigue, weight loss and reduced activity in humans.

Lemaréchal *et al.* (2022) recognised five frailty domains in dogs: weakness, slowness, low endurance, inactivity and shrinking (i.e. weight loss as reported by the caregiver) and it was found that dogs showing three or more signs were twice as likely to die within six months. Russell *et al.* (2024) have introduced another similar tool assessing nutrition, exhaustion, weakness, social withdrawal and mobility and found that frail dogs were nearly five times more likely to die within the same period.

These frailty tools aim to identify dogs' intrinsic capacity and those needing more support and guide caregivers on how to reduce risk and maintain quality of life, often through environmental adaptations and appropriate exercise. It's hoped through emphasising what the dog can still do rather than solely focusing on deficits may help shift caregiver mindset and improve the uptake of recommendations.

Polypharmacy

Older dogs with OA often have multiple chronic conditions and frequently receive polypharmacy. Veterinary medicine lacks comprehensive guidance on the cumulative effects of multiple medications in individual patients, unlike human healthcare, where polypharmacy is a recognised risk factor for adverse events and decreased physical resilience and mobility.

Effect of Environment on Welfare

In most homes with a beloved pet, the concept of poor welfare may be too distressing, alarming or insulting to introduce to a caregiver without losing their trust. Traditional welfare frameworks such as the Five Freedoms have focused on avoiding negative welfare states, but recent moves to the Five Domains model reminds us to consider the animal's psychological needs alongside their physical ones, prompting

The Five Freedoms	The Five Domains
Freedom from hunger and thirst	Nutrition – giving sufficient, balanced, varied and clean food and water
Freedom from discomfort	Environment – comfort through temperature, substrate, space, air, odour, noise and predictability
Freedom from pain, injury and disease	Health – enabling good health through absence of disease, injury, impairment with a good fitness level
Freedom to express normal behaviour	Behaviour – providing varied, novel and engaging enrichment through sensory inputs, exploration, foraging, bonding, playing, retreating and others
Freedom from fear and distress	Mental state – the animal should benefit from predominantly positive states, e.g., pleasure or comfort, while reducing negative states such as fear, frustration, hunger, pain, or boredom

Figure 2: The globally respected Five Freedoms have been recently reviewed to include 'freedom to,' rather than solely focusing on 'freedom from' and are now called the Five Domains Model of Animal Welfare

us to not only prevent suffering but also to actively enrich their lives in a world that we control and may be more intuitively palatable to caregivers.

Sleep Needs

The bidirectional relationship between disturbed sleep and chronic pain is well established. Osteoarthritis has been shown to disrupt sleep in humans and activity monitoring has demonstrated similar findings in dogs with OA (Smith, Mendl & Murrell, 2022).

While definitive guidelines for sleep hygiene in dogs do not yet exist, logic suggests that dogs – being polyphasic sleepers that require significant amounts of sleep – require undisturbed opportunities both day and night and that we should accommodate their preferences through offering choice. Beds should be firm, supportive, stable and easy to access and exit. Providing multiple beds of different designs and locations – situated away from slippery floors, stairs, walkways, drafts, excessive heat, or bright lighting – can help create secure, undisturbed rest environments that promote restorative sleep.

Mental Engagement Needs

Cognitive processing – the mental processes involved in acquiring, processing and using knowledge – has a bidirectional relationship with chronic pain. Attention to pain facilitates the experience, whereas distraction has an inhibitory effect. In fact, it has been proposed that the development of chronic pain is in part related to dysfunctional extinction of pain related memories (Phelps, Navratilova & Porreca, 2021).

Encouraging clients to frequently provide mentally stimulating and rewarding activities – especially for less mobile patients – can counter the loss of less suitable activities. Extending feeding times through achievable puzzle feeders, scatter feeding and hide and seek games can provide both pleasure and distraction. Increasing caregiver interaction via play, training, scent work and games – along with enriching the animal's environment with novel smells, sights, sounds and tactile experiences – can activate neuromodulatory mechanisms that influence their perception of pain.

What do Environmental Modifications Look like for Canine Osteoarthritis Patients?

Environmental adaptations are not prescriptive; rather, they are patient-centred, aiming to preserve the individual dog's quality of life and must remain flexible and tailored to the unique context of each case. They should align with the

caregiver's physical, emotional, time, financial and belief budgets.

To help guide caregivers, the acronym SEE can be used as a practical and memorable framework when discussing environmental changes:



Figure 3: S – Safer, E – Easier, E – Enjoyable, a memorable acronym when adapting the home environment





Thresholds

Beds

Flooring

Feeding stations

Stairs

Figure 4: Common Obstacles in a Typical Home

Joint Protection in the Veterinary Setting

‘Joint protection,’ is a well-established concept in human healthcare involving environmental modifications, activity pacing, task adaptations and the use of assistive devices to make daily activities more manageable through reducing joint load, maintaining joint function, minimising pain and avoiding overuse (Hammond, 2013). Studies show that individuals engaging in joint protection programmes report reduced pain, improved functional capacity and slower disease progression. As a result, joint protection is strongly recommended by the Osteoarthritis Research Society International (OARSI) as a core component of osteoarthritis management (McAlindon *et al.*, 2014).

While strong veterinary-specific evidence is currently limited, it is reasonable to infer that consistently minimising repetitive, concussive, or rotational forces on compromised joints and surrounding soft tissues can help reduce pain and potentially slow the progression of joint disease in dogs, as seen in human medicine.

Initiating conversations about home modifications can be challenging. Posing targeted questions, such as ‘Guide me through a typical day from when you first wake up,’ or gaining visual context through caregiver-recorded videos can help identify key environmental challenges. Ensuring that the

client has access to further resources post consultation is essential to continue to motivate them to complete necessary changes. Environmental adaptations are not ‘logical,’ to caregivers and even engaged clients take multiple prompts before a suggested change is implemented. Human behaviour change is fraught with difficulties because we are effectively attempting to rewire deeply rooted habits, beliefs and social norms. Recognising these barriers, implementing a graded introduction and providing inspiring resources can help.

Normalising environmental adaptations by embedding them within already accepted approaches, rather than presenting them as a standalone or optional extra, may improve caregiver uptake and compliance by shifting adaptations from being perceived as ‘add-ons,’ to being recognised as fundamental components of a management plan.

Conclusion and Key Points

Osteoarthritis in dogs has long been considered an appropriate model for study of the disease in humans, but the knowledge gained from it has not been applied equally to both species. Environmental adaptations are considered essential in human OA management and the time is long overdue for it to be the same in dogs.

We have an opportunity to involve the caregiver in impactful interventions but also need to ourselves identify the importance of environment and subsequently provide guidance to the clients and their pets in our care.

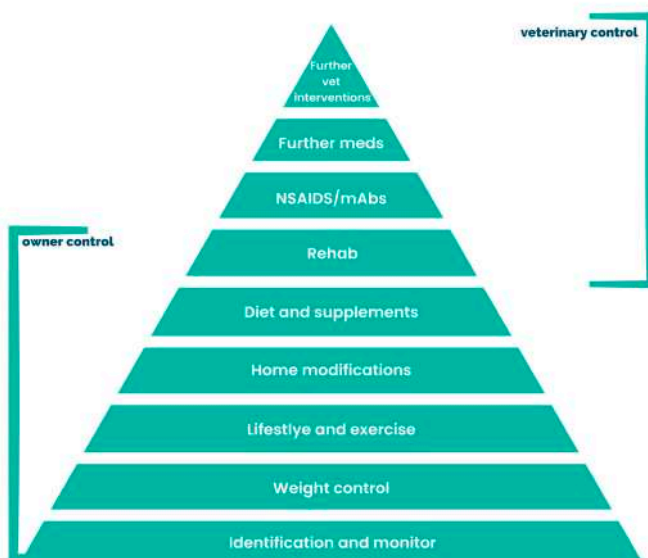


Figure 5: Incorporating environmental adaptations into a standardised approach, as seen here in Canine Arthritis Management’s caregiver’s volume of influence pyramid cement their importance in the multimodal approach. *Further veterinary intervention



Hannah Capon

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