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Sleep across the canine lifespan: development, aging, and cognitive decline

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Abstract: Sleep is a fundamental behavioral and neurophysiological process that plays a critical role in the well-being of dogs (*Canis lupus familiaris*). As a species that shares its life closely with humans, the dog has become an increasingly valuable model for studying sleep physiology and its relationship with aging and neurodegenerative diseases. This review provides a comprehensive overview of the changes in sleep patterns that occur across the different stages of a dog's life, from the neonatal period to senescence. In neonates, sleep is dominated by REM activity, which supports synaptic pruning and early neural circuit development. During the juvenile phase, progressive maturation of sleep electrophysiology occurs, with full stabilization extending beyond 24 months of age. In adulthood, dogs exhibit a polyphasic sleep pattern characterized by distinct REM and NREM stages, sleep spindles subject to sexual dimorphism, and hemispheric asymmetry during sleep. With aging, sleep becomes increasingly fragmented, with reductions in REM sleep and compensatory increases in daytime napping. These changes are particularly pronounced in dogs affected by Canine Cognitive Dysfunction Syndrome, a neurodegenerative condition analogous to Alzheimer's disease in humans, where impaired NREM sleep compromises the glymphatic clearance of beta-amyloid and tau proteins. The growing availability of non-invasive polysomnographic techniques positions sleep assessment as a promising tool for the early detection and monitoring of age-related cognitive decline in veterinary practice.

Key Words: dog, canine, sleep, age, REM.

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Introduction

Dogs have shared their lives with humans for thousands of years. As a result, there is growing attention to their behavior to ensure a better quality of life.

One behavior that plays a crucial role in the lives of both dogs and humans, due to the significant amount of time dedicated to it, is sleep.

Sleep is defined as a relatively immobile, reversible state characterized by absent or limited responsiveness to the external environment associated with reduced or altered consciousness rather than its complete loss (Reicher et al., 2021b; Siegel, 2005). It is regulated by circadian and homeostatic processes (Nicolau et al., 2000; Reicher et al., 2021b) and is marked by the following behavioral features: a species-specific body position, prolonged behavioral inactivity, an increased arousal threshold, and rapid behavioral reversibility upon awakening (Campbell & Tobler, 1984; Kortekaas & Kotrschal, 2019; Nicolau et al., 2000). Animals that exhibit fewer of these characteristics are considered not to experience true behavioral sleep but rather periods of activity or inactivity (Nicolau et al., 2000).

In recent years, numerous studies have explored this topic to use sleep as a method for assessing animal welfare, as certain neurological disorders primarily cognitive dysfunction (Ciurli et al., 2023a, 2023b) as well as behavioral conditions such as anxiety (Lodrini et al., 2025) and phobias (Gazzano & Ogi, 2020), can affect it. Sleep is indeed a vital behaviour that can reflect a dog's adaptation to its environment and, as such, represents a meaningful indicator of its welfare (Kinsman et al., 2020).

To understand what influences, sleep behavioral patterns, it is essential to determine what constitutes physiological sleep across different age groups. The primary focus of research is the physiological structure of sleep and changes in its duration in response to external or internal stimuli that may affect it.

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From birth, modifications in the sleep-wake cycle can be observed in all living beings, as demonstrated by several studies evaluating differences in sleep patterns across various life stages (Fox, 1967; Reicher et al., 2021b). Age and related disorders significantly influence dogs' sleep both quantitatively and qualitatively (Kinsman et al., 2020; Takeuchi & Harada, 2002; Woods et al., 2020; Zanghi et al., 2013).

This is a narrative review of canine sleep across the lifespan, with a particular focus on how sleep changes with age. Specifically, we describe (i) the maturation of sleep architecture and electrophysiology during development, (ii) the organization of physiological sleep in healthy adult dogs, and (iii) the alterations observed with aging, including their relationship with Canine Cognitive Dysfunction Syndrome (CCDS). Throughout, sleep is considered both as a physiological process and as a potential non-invasive indicator of welfare and cognitive health, and the relevance of the dog as a translational model for human cognitive aging is highlighted. An overview of the main sleep characteristics, methods, and findings across the canine lifespan is provided in Table 1, and the principal age-related changes are summarized schematically in Figure 1. The following sections describe each life stage in turn, from the neonatal period to cognitive decline associated with CCDS.

Table 1. Main sleep characteristics, methods, and findings across the canine lifespan, from the neonatal period to cognitive decline associated with CCDS.

Life stage	Main sleep characteristics	Main methods used in studies	Key findings	Representative references
Neonatal / early postnatal (0–4 months)	REM (active) sleep predominant; quiet sleep increasing; rapid neural maturation	Behavioural observation; EMG, ECG, respiration recordings	Active sleep declines and wakefulness increases with age (midpoint ~4 weeks); REM sleep supports synaptic pruning and neural circuit development	*Fox, 1967; Takahashi & Inada, 1986; Li et al., 2017*
Puppy to young adult (4–12 months)	Progressive stabilisation and maturation of NREM and REM sleep; spectral maturation	Non-invasive polysomnography (PSG); owner questionnaires	Drowsiness plateaus ~8 months, REM ~6 months; delta power decreases, theta/sigma/beta increase; EEG approaches maturity ~12 months (full stabilisation may extend beyond 24 months)	*Kinsman et al., 2020; Reicher et al., 2021b; Pellegrino & Gómez Álvarez, 2023*
Healthy adulthood	Polyphasic sleep; distinct REM and NREM stages; sleep spindles (sexual dimorphism); hemispheric asymmetry	Non-invasive PSG; EEG	Sleep ~10–14 h/day (43–60% of 24 h); REM 20–36% of sleep; tendency to wake after REM; interhemispheric asymmetry across sleep cycles	*Lucas et al., 1977; Adams & Johnson, 1993; Iotchev et al., 2017, 2019; Reicher et al., 2021a*
Aging / senescence	Sleep fragmentation; reduced REM sleep; increased nocturnal wakefulness; compensatory daytime napping	Actigraphy; PSG; questionnaires	More nap bouts of unchanged duration; chronic pain (e.g. osteoarthritis) disrupts nocturnal rest; analgesia improves sleep quality	*Takeuchi & Harada, 2002; Zanghi et al., 2013; Woods et al., 2020*
Cognitive decline (CCDS)	Further reduction in REM and NREM sleep; shallower, more disrupted sleep	PSG; CADES questionnaire; cognitive testing; EEG; fluid biomarkers	Higher dementia (CADES) scores associated with less REM and NREM sleep and poorer cognition; sleep and EEG measures proposed as markers of neurodegeneration	*Mondino et al., 2023a; Mondino et al., 2022; Ciurli et al., 2026*

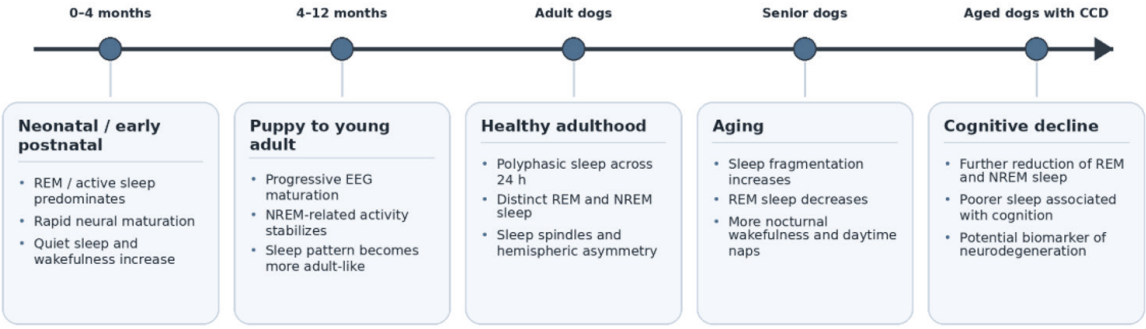

Figure 1. Schematic representation of the main sleep changes across the canine lifespan, from the neonatal period to cognitive decline associated with CCDS.

Methodological considerations

Studies of canine sleep rely on methods that differ substantially in resolution and in the type of information they provide, and these differences should be borne in mind when comparing results across the lifespan. Owner-completed questionnaires (e.g. Kinsman et al., 2020) allow large samples and capture habitual sleep in the home environment, but depend on subjective report and cannot resolve sleep stages. Actigraphy (Zanghi et al., 2013) provides objective, long-term recordings of rest–activity rhythms, yet it infers sleep from movement and tends to overestimate sleep during quiet wakefulness while being unable to distinguish REM from NREM. Behavioural observation (Fox, 1967; Adams & Johnson, 1993) describes sleep–wake patterns in naturalistic conditions but, again, without electrophysiological staging. Non-invasive polysomnography (Kis et al., 2017; Reicher et al., 2021a, 2021b) is the only approach that resolves sleep macro- and microstructure, but recordings are usually short, obtained in laboratory settings, and may be influenced by a first-night effect. Consequently, estimates of total sleep time, REM/NREM proportions, sleep fragmentation, and daytime napping are not directly comparable across studies, and apparent discrepancies may partly reflect methodological rather than biological differences. This should be taken into account throughout the present review.

Neonatal and early postnatal development: 0–4 months

In this review, the first months of life are considered together as a period of early postnatal development, during which the nervous system undergoes its most rapid structural and functional maturation. Strictly speaking, the neonatal period covers only the first weeks of life; the broader 0-4 month window is used here because the major sleep-related changes track the underlying neural maturation, which continues well beyond the neonatal phase. More generally, the age categories adopted here follow developmental stages rather than fixed thresholds, in line with recent proposals for normative age groupings in dogs (Harvey, 2021).

It has been demonstrated that NREM sleep during the first weeks of life can be divided into 4 stages influenced by development. These stages are 0-6 weeks, where there are significant changes in neuronal elements such as an increase in brain weight, dendritic development, and rapid myelinization, especially in the first 2-4 weeks; 6-14 weeks, which show later morphological maturation (Takahashi & Inada, 1986).

In 1967, Fox conducted a study using behavioral evaluations, electromyogram, electrocardiogram, and respiration recordings on fifteen puppies from birth until 5 weeks of age, away from the litter environment, to compare behavioral sleep during growth (Fox, 1967). The results showed a rapid decline in time spent in active sleep and a gradual increase in the ability to maintain wake-

fulness in a novel environment, consistent with a previous study by Charles and Fuller (Charles & Fuller.,1956). The midpoint at which these two phases are equally long occurs at 4 weeks of age (Fox, 1967), at which point there is also an increase in quiet sleep. This age likely represents the moment when reticular activation integrates with thalamocortical structures. The high time spent in REM sleep in neonates is probably due to the absence of control on the bulbo-pontine region by the thalamocortical sleep center, a later-developing structure (Fox, 1967). This predominance of REM sleep in early life is consistent with its proposed role in synaptic pruning and the maintenance of newly formed connections, processes critical for neural circuit development; this role, however, has been demonstrated mainly in rodents and is extrapolated to the dog (Li et al., 2017). The strong association between REM sleep and immaturity at birth further supports this role, as observed in other species (Siegel, 2005). In parallel, changes in NREM sleep reflect the ongoing maturation of the brain (Takahashi & Inada, 1986).

From puppy to adulthood: 4 – 12 months of age

It should be noted that the boundary between puppyhood and adulthood is not fixed: the timing of physical maturation varies considerably with breed and body size, with larger breeds reaching adult body weight later than smaller ones (Salt et al., 2017). The 4–12 month window should therefore be regarded as an approximation rather than a strict threshold.

During this developmental phase, the stabilization and maturation of various sleep stages, particularly non-REM (NREM) sleep, occurs between 14–24 weeks and 24–50 weeks (Takahashi & Inada, 1986).

Kinsman et al. investigated the physiological sleep patterns of 16-week-old puppies and 12-month-old dogs in a domestic environment, relying on owner-completed questionnaires. Their findings revealed that 16-week-old puppies slept longer during the day but less at night compared to 12-month-old dogs (Kinsman et al., 2020).

Further research by Reicher et al. examined behavioral and polysomnographic changes in dogs from two to thirty months of age, focusing on sleep macrostructure (including drowsiness, REM, and NREM) and spectral power activity (delta, theta, alpha, sigma, and beta waves) (Reicher et al., 2021b). Their results showed a positive correlation between age and time spent in drowsiness, which stabilized at eight months of age. This pattern mirrors NREM1 in human infants, which increases around two months of age. However, no significant correlation was found between NREM sleep and age, likely due to the absence of distinct NREM sleep stages in dogs, unlike in humans. REM sleep, on the other hand, increased with age and stabilized at six months (Reicher et al., 2021b).

Changes in spectral power activity were also observed. Delta power activity showed a negative correlation with age, like synaptic pruning in humans. Theta activity increased, particularly between eight and fourteen months, and a noticeable rise in alpha activity was observed around eight months. Additionally, both sigma and beta power activity were positively correlated with age (Reicher et al., 2021b).

Based on these findings, it is estimated that the central nervous system of dogs begins to approach maturity around 12 months of age, with EEG characteristics typical of the adult brain starting to emerge at this stage, although full electrophysiological stabilization may extend beyond 24 months (Pellegrino & Gómez Álvarez., 2023). It should be noted that estimates of the age at which sleep electrophysiology stabilises vary between studies, ranging from around 12 months to beyond 24 months. This discrepancy likely reflects differences in recording conditions, the breeds examined, and the specific EEG features considered, and it underlines that a single age boundary for “maturity” should be interpreted with caution.

Adulthood

Sleep architecture

In adulthood, physiological sleep is characterized by two distinct types of electroencephalographic (EEG) activity within a 24-hour period: REM sleep and NREM sleep (Adam, 1994; Franken et al., 2001; Schork et al., 2022). Adult dogs typically sleep between 43 and 60% of the 24-hour cycle, corresponding to approximately 10–14 hours per day (Schork et al., 2022; Zanghi et al., 2013).

REM sleep is marked by desynchronized, rapid waveforms with low amplitude (Adam, 1994; Reicher et al., 2021b; Schork et al., 2022) and is distinguished by bursts of rapid eye movement and muscle atonia (Nicolau et al., 2000; Staunton, 2005). During this stage, homeostatic regulation is impaired, leading to increased heart rate variability and irregular respiration (Nicolau et al., 2000).

NREM sleep, in contrast, features synchronized, slow waveforms with high amplitude (Reicher et al., 2021a). It is associated with behavioral unconsciousness (Nicolau et al., 2000; Staunton, 2005) and an increase in parasympathetic tone (Staunton, 2005), resulting in deep, regular respiration, a decreased heart rate, and lower heat production, with a slight reduction in thermoregulation (Nicolau et al., 2000). In humans, this sleep stage is further divided into four sub-stages based on EEG characteristics. NREM 1, the transition from wakefulness is characterized by the disappearance of alpha waves (8–12 Hz) and an increase in low-voltage theta activity (4–8 Hz). NREM 2 exhibits theta and delta (1–4 Hz) activity, sleep spindles (sigma bursts, 12–16 Hz (Reicher et al., 2021b) or 9–16 Hz (Iotchev et al., 2017)), and high-voltage isolated waves known as K-complexes (Nicolau et al., 2000). The third and fourth stages, collectively referred to as slow-wave sleep (SWS), are dominated by high-voltage delta waveforms. This four-stage classification is particularly well-defined in humans but does not apply directly to dogs and other carnivorous and insectivorous mammals, in which drowsiness replaces NREM 1 and periods of quiet wakefulness are observed instead (Kis et al., 2017). Accordingly, in dogs sleep–wake states are usually described as wakefulness, drowsiness, NREM (or slow-wave) sleep, and REM sleep, rather than through the full human NREM staging. Drowsiness, an intermediate phase between wakefulness and sleep, is characterized by quiescence and a low arousal threshold (Campbell & Tobler, 1984; Kis et al., 2017). Some researchers suggest considering only SWS instead of distinguishing between NREM sub-stages (Nicolau et al., 2000; Reicher et al., 2021a).

As in humans, sleep spindles have also been identified in dogs. These are brief bursts of thalamo-cortical activity in the sigma range (Iotchev et al., 2017, 2019, 2024; Iotchev & Kubinyi.,2021), appearing in EEG recordings as symmetrical wave trains lasting at least half a second (Iotchev et al., 2017, 2019, 2024).In humans, spindles are classified into slow spindles (10.25–12 Hz, frontal cortex) and fast spindles (14 Hz, central and posterior regions), both of which are associated with memory consolidation and sleep stability (Iotchev et al., 2017; 2024.,Iotchev & Kubinyi.,2021). They are thought to suppress conflicting cortical information, facilitating cognitive processing (Iotchev et al., 2017). In dogs, sleep spindles (9–16 Hz) occur during NREM sleep and are subject to sexual dimorphism (Iotchev et al., 2017, 2019). Like humans, fast spindles increase with age and are more prevalent in females, whereas slow spindles decline over time; both types are influenced by hormonal regulation (Iotchev et al.,2019).

The sleep-wake cycle in dogs

Dogs are polyphasic sleepers (Kis et al., 2017; Reicher et al., 2021a), meaning they sleep in multiple bouts throughout the 24-hour period (Adams & Johnson, 1993; Schork et al., 2022; Takahashi & Inada, 1986). While they sleep primarily at night, they also experience 23–60 sleep episodes during the day, typically sleeping for 43–60% of the 24-hour cycle (Schork et al., 2022),

with 71.8% of their sleep occurring at night and 2.8% during the day (Owczarczak-Garstecka & Burman., 2016). REM sleep accounts for 20–36% of total sleep (Schork et al., 2022). Notably, daytime naps differ from nocturnal sleep in that they involve fewer and shorter NREM cycles and a lower proportion of REM sleep (Mivalt et al., 2023).

The scientific study of the canine sleep-wake cycle dates to 1977, when Lucas et al. used EEG recordings on six pointer dogs, identifying distinct sleep states and periods of wakefulness. The dogs spent 44% of the recorded time awake, 21% in drowsiness, 23% in SWS, and 12% in REM sleep, with an average polycyclic sleep-wake cycle of 83 minutes, consisting of 38 minutes awake and 45 minutes asleep (Lucas et al., 1977). Later, Adams and Johnson (1993) observed 24 domestic dogs and found that they experienced approximately three sleep sessions per hour at night, each lasting 21 minutes – with 16 minutes spent sleeping (quiet and active sleep) and 5 minutes awake (Adams & Johnson, 1993). Recent studies confirm that dogs undergo wakefulness, drowsiness, at least six minutes of NREM sleep, and REM sleep (Kis et al., 2017; Reicher et al., 2021a). Unlike humans, dogs tend to wake up immediately after REM sleep – an evolutionary adaptation likely reducing vulnerability to predators (Adams & Johnson, 1993; Reicher et al., 2021b). Additionally, animals awakened from REM sleep demonstrate better sensory-motor function compared to those roused from NREM sleep (Siegel, 2005). These estimates should, however, be compared with caution. The studies differ in recording method (EEG versus behavioural observation), sample size, breed, and housing conditions (laboratory versus domestic environment), all of which may contribute to the variability reported in the number and duration of sleep episodes. Such methodological heterogeneity, rather than true biological differences, may account for at least part of the discrepancies across studies.

Hemispheric asymmetry

The sleep-wake cycle has also been examined in terms of hemispheric asymmetry in brain activation during canine sleep. Hemispheric asymmetry is well-documented in aquatic mammals, where keeping one hemisphere active allows for environmental awareness (Tamaki et al., 2016). Reicher et al. investigated this phenomenon in dogs and observed interhemispheric differences during wakefulness; however, asymmetric neural activity during sleep had not been previously explored (Reicher et al., 2021b). A dedicated study by Reicher et al. (2021a) using non-invasive polysomnography found left hemispheric predominance in the slow frequency range during the first sleep cycle, while greater absolute asymmetry in the alpha, sigma, and beta ranges emerged in the second cycle – a pattern suggestive of an adaptation-like process that does not closely resemble the asymmetry described in humans (Reicher et al., 2021a).

From adulthood to aging

With aging, significant alterations in sleep patterns have been observed in dogs. Research has demonstrated that older dogs experience sleep fragmentation, a reduction in REM sleep (Takeuchi & Harada, 2002), increased wakefulness during the night (Takeuchi & Harada, 2002; Woods et al., 2020), and a compensatory rise in NREM sleep during the daytime (Kinsman et al., 2020; Zanghi et al., 2013) to make up for the loss of nighttime rest (Takeuchi & Harada, 2002). This adaptation is primarily driven by an increase in the number of nap bouts during the light phase, though their duration remains unchanged (Zanghi et al., 2013). Beyond age-related changes per se, chronic pain conditions, which are common in older dogs, particularly osteoarthritis, have been shown to further disrupt nocturnal rest, with analgesic treatment demonstrably improving sleep quality in affected animals (Woods et al., 2020).

One of the most significant aging-related disorders in dogs is Canine Cognitive Dysfunction

Syndrome (CCDS), a neurodegenerative disease extensively studied in veterinary medicine due to its similarities with Alzheimer's disease in humans (Ciurli et al., 2023a). The relationship between aging, sleep, and cognition in dogs can be framed as a logical sequence: aging alters sleep structure; cognitive dysfunction further disrupts sleep quality and duration; impaired sleep may in turn compromise the clearance of neurotoxic proteins; and, consequently, sleep parameters may acquire diagnostic or prognostic value in aging dogs (Mondino et al., 2023a). Each step of this pathway is considered below. Several studies have demonstrated that dogs with cognitive impairment exhibit alterations in both sleep quality and duration (Ciurli et al., 2023a). To diagnose and assess the severity of CCDS, various evaluation tools for geriatric patients have been developed, incorporating both clinical and behavioral criteria (Ciurli et al., 2023b). Beyond behavioural and clinical criteria, several biomarkers have been investigated for the diagnosis and staging of CCDS (Ciurli et al., 2026); among these, plasma concentrations of beta-amyloid and phosphorylated tau have been proposed as markers of age-related cognitive decline in dogs, with age showing a significant positive correlation with CADES scores (Gazzano et al., 2024).

In human medicine, Alzheimer's disease is associated with a decline in both deep NREM and REM sleep (Takeuchi & Harada, 2002). NREM sleep plays a crucial role in the activation of the glymphatic system – a brain-wide clearance pathway that removes toxic metabolites, including beta-amyloid and tau, from the interstitial fluid during sleep (Holth et al., 2019; Jessen et al., 2015). Sleep deprivation has been shown to impair this clearance mechanism, accelerating the accumulation of both proteins and exacerbating cognitive impairment (Holth et al., 2019; Nedergaard & Goldman, 2020). Although this clearance mechanism has been characterised mainly in rodents and humans (Jessen et al., 2015; Holth et al., 2019), its relevance to the dog is plausible, given the close similarities between canine and human sleep and the spontaneous amyloid pathology that develops in aging dogs (Cummings et al., 1996); direct evidence in dogs, however, remains limited. More recently, alterations in REM sleep microstructure have also been implicated, with REM sleep changes in aging being associated with neocortical amyloid deposition and neurodegeneration (Andrè et al., 2023).

Building on this evidence, Mondino and colleagues conducted a study involving 28 senior dogs, employing polysomnography recordings, the CADES questionnaire, and behavioral assessments to analyze sleep structure and duration in relation to dementia (Mondino et al., 2023b). Their findings revealed that dogs with higher CADES scores – indicative of more severe cognitive dysfunction – experienced reduced REM and NREM sleep. Additionally, cognitive performance and problem-solving abilities were positively correlated with time spent in these restorative sleep stages.

The study of sleep physiology in dogs has significantly advanced our understanding of the relationship between sleep and cognitive aging in companion animals, revealing striking parallels with human neurodegenerative processes. Companion dogs naturally develop age-related cognitive decline and sleep alterations that closely mirror those observed in humans, positioning them as a uniquely valuable translational model for the study of cognitive aging and sleep (Bódizs et al., 2020). Unlike laboratory rodents, companion dogs share the human environment and lifestyle, are exposed to the same environmental factors, and develop spontaneous pathologies, including Alzheimer's-like amyloid deposition and sleep spindle changes, that are not easily reproduced in transgenic animal models (Iotchev et al., 2019). This cross-species convergence suggests that insights derived from canine sleep research may not only improve the welfare of aging dogs but may also inform the development of early diagnostic tools and therapeutic strategies for age-related cognitive decline in humans.

These findings highlight the potential of electroencephalographic analysis across different behavioral states and life stages as a valuable tool for monitoring the progression of neurodegenerative diseases in dogs, with quantitative EEG already shown to distinguish healthy, at-risk, and affected animals (Mondino et al., 2022). As research continues to deepen our understanding of

the link between sleep and cognitive health, sleep assessment may become an essential component in the early detection and management of dementia in aging pets.

Conclusion

Sleep changes substantially across the canine lifespan, reflecting both neurodevelopmental maturation and age-related decline. In early life, REM/active sleep predominates and supports brain development, whereas adulthood is characterized by a more stable polyphasic sleep pattern with distinct REM and NREM stages. In senior dogs, sleep becomes more fragmented, with reduced REM sleep, increased nocturnal wakefulness, and compensatory daytime napping. These changes are especially relevant in dogs with CCDS, in which altered sleep may be associated with cognitive impairment and neurodegenerative processes.

From a clinical perspective, sleep assessment may become a useful non-invasive tool for geriatric screening, welfare evaluation, and the early identification or monitoring of cognitive decline in dogs. However, further longitudinal studies using standardized polysomnographic protocols are needed to define age-specific reference values and clarify the diagnostic and prognostic value of sleep parameters in veterinary practice.

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Il sonno nelle diverse fasi di vita del cane: sviluppo, invecchiamento e declino cognitivo

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Sintesi

Il sonno è un processo comportamentale e neurofisiologico fondamentale che svolge un ruolo cruciale nel benessere del cane (*Canis lupus familiaris*). In quanto specie che condivide strettamente la propria vita con l'essere umano, il cane è diventato un modello sempre più prezioso per lo studio della fisiologia del sonno e della sua relazione con l'invecchiamento e le malattie neurodegenerative. Questa review fornisce una panoramica completa dei cambiamenti nei pattern di sonno che si verificano nelle diverse fasi della vita del cane, dal periodo neonatale alla senescenza. Nei neonati, il sonno è dominato dall'attività REM, che sostiene la potatura sinaptica e il precoce sviluppo dei circuiti neurali. Durante la fase giovanile, si osserva una progressiva maturazione dell'elettrofisiologia del sonno, con una piena stabilizzazione che si estende oltre i 12 mesi di età. Nell'adulto, i cani presentano un pattern di sonno polifasico caratterizzato da distinte fasi REM e NREM, fusi del sonno soggetti a dimorfismo sessuale e asimmetria emisferica durante il sonno. Con l'invecchiamento, il sonno diventa progressivamente più frammentato, con riduzioni del sonno REM e un aumento compensatorio dei sonnellini diurni. Questi cambiamenti sono particolarmente pronunciati nei cani affetti da Disfunzione Cognitiva Canina, una condizione neurodegenerativa analoga alla malattia di Alzheimer nell'uomo, in cui il sonno NREM compromesso riduce la clearance glinfatica delle proteine beta-amiloide e tau. La crescente disponibilità di tecniche polisonnografiche non invasive posiziona la valutazione del sonno come uno strumento promettente per la diagnosi precoce e il monitoraggio del declino cognitivo età-correlato nella pratica veterinaria.