

Article

Undercover Dogs: Pet Dogs in the Sleep Environment of Patients with Chronic Pain

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Abstract: (1) Background: Chronic pain is a significant and prevalent condition in many industrialized nations. Pain and sleep’s reciprocal nature suggests that interventions to improve sleep may decrease pain symptoms. Little attention has been paid to the influence that owning a pet dog has on the pain/sleep relationship. Typical advice to remove pets from the bedroom negates the possible positive benefit of human-animal co-sleeping. Aim: To investigate pain patients’ perceived impact of pet dog ownership on sleep. (2) Methods: We carried out a content analysis of interview data focused on the impact of pet dog ownership on sleep. The qualitative dataset comes from a subgroup of participants in a larger study examining the pain patient/canine relationship. This subgroup of participants from the larger study was asked, “Does your dog have a positive or negative impact on your sleep?” The data were thematically coded using an iterative approach. (3) Findings: Codes included: companionship; physical presence/‘cuddles’; routine/schedule; distraction from anxiety/worry at night; reassuring/protective presence; active intervention to keep participant safe; daytime activity to promote sleeping at night; and reciprocal concern for the sleep of the pet dog. (4) Conclusions: Pet dogs may play important roles in helping people with chronic pain achieve sleep onset and maintenance. Removing the dog to improved sleep could be counter-productive and lead to additional sleep-related issues.

Keywords: human-animal interaction; dog; sleep; chronic pain; content analysis

1. Introduction

Both chronic pain and sleep disorders are prevalent and growing problems with significant costs to the individual, family, employers and society at large (Antaky et al. 2017; Ferrie et al. 2011; Phillips 2009). Chronic pain has an estimated prevalence rate of between 10–20% in many industrialized nations and has been identified as a significant public health concern (Goldberg and McGee 2011). Costs of chronic pain include not only medical treatment but also lost productivity and other socio-economic impacts such as family and citizenship roles. A 2012 study in the United States determined that, conservatively estimated, the yearly costs of chronic pain were greater than those related to heart disease (\$309 billion), cancer (\$243 billion) and diabetes (\$188 billion) (Gaskin and Richard 2012). Similarly, the prevalence rates of sleep deficiency are high, with reports of upwards of 30% of adults in industrialized countries routinely achieving less than the recommended hours per night (Hafner et al. 2017). This pattern is also seen in developing nations and is anticipated to increase as industrialization and other socio-political factors evolve (Stranges et al. 2012).

That sleep deficiency is a significant issue for persons living with pain has been well-established (Andrews et al. 2014; Finan et al. 2013) and conservative estimates are that between 50–90% of patients in treatment for chronic pain also experience sleep problems (Tang 2008). The relationship is multifactorial. For example, pain interferes with relaxation and rest, the consequences of living with pain can increase stress and worry; and stress and worry can trigger neurochemical and hormonal reactions that preclude sleep (Han et al. 2012). The hypothalamic-pituitary-adrenal (HPA) axis is strongly related to both pain and sleep (Generaal et al. 2014) and a growing body of evidence reflects that pain and sleep have both a reciprocal nature and multiple shared neurophysiological mechanisms (Aili et al. 2015; American Sleep Association n.d.; Lerman et al. 2017; Smith and Haythornthwaite 2004). This bidirectional relationship suggests that interventions to improve sleep will contribute to a decrease in negative symptoms for persons with pain (Lerman et al. 2017; Smith and Haythornthwaite 2004).

Because of their complex, bio-psycho-social etiologies, both pain and chronic sleep deficiency are resistant to intervention. Typically, pain patients will receive medication and, if available, non-pharmacological psych-education and behavioral therapies to assist with sleep (Stiefel and Stagno 2004). However, ongoing use of sleep medication can contribute to a range of negative side-effects and insomnia management guidelines recommend short term use only (Riemann et al. 2017). While cognitive-behavioral therapies (CBT) are regarded as first-line interventions (Riemann et al. 2017) this form of treatment is not always acceptable to patients nor readily available (Koffel et al. 2018). Beyond CBT, few studies exist specific to development and testing of pragmatic and accessible non-pharmacological sleep strategies for persons with pain and research is much needed.

This paper addresses one such under-explored area; the possible influence of owning a pet dog on the pain/sleep relationship. The typical advice for anyone experiencing sleep problems is to remove the pet from the bedroom, underline the singular assumption that pets interfere with sleep (American Sleep Association n.d.; Bloom et al. 2009). Research on the relationship between service dogs and sleep is meager and a search of the literature revealed no systematic reviews, only a literature review published in a sleep magazine (Rose et al. 2015). Research regarding pet animals and specifically dogs, is even more sparse (Patel et al. 2017).

In this paper, we are interested in pet dogs (“an animal that you keep in your home to give you company and pleasure”) (Collins Online English Dictionary n.d.) as opposed to service dogs (“any dog that is individually trained to do work or perform tasks for the benefit of an individual with a disability, including a physical, sensory, psychiatric, intellectual, or other mental disability”) (Americans with Disability Act National Network 2014). As a preliminary step in addressing the existing evidence-gap regarding pet dogs (who are not trained service dogs), we carried out a content analysis of comments specifically focused on the impact of dog ownership on sleep. The qualitative dataset came from a subgroup of participants in a larger study examining the human/canine relationship for those persons living with chronic pain (Carr et al.).

Many people co-sleep with a human partner, a pet, or both. Co-sleeping is defined as sharing a bed or bedroom during any portion of the night, where individuals are in close enough proximity to exchange at least two sensory stimuli such as touch, smell, movement, sight and sound (Goldberg and Keller 2007). These sensory stimuli would be similar regardless if the co-sleeping occurred with a human or a pet and our background literature search included both. However, we found little research specific to persons with pain co-sleeping with either other people, pets, or both. We did find one study of co-sleep between children and parents with pain whose authors concluded that co-sleeping may be advantageous in certain contexts. These researchers questioned the benefit of generic recommendations to avoid co-sleeping (Goldberg and Keller 2007). One review (Smith et al. 2017) identified that co-sleeping research had focused predominantly on human/human co-sleep and, to all intents, has neglected the highly prevalent practice of human/pet co-sleeping. Studying human/pet co-sleeping and the general influence of pet ownership on sleep overall is important on many levels. The practice of co-sleeping alters the sleep environment by introducing

additional sound, movement, odor and sources of body heat/temperature change (Krahn et al. 2015). Co-sleeping increases an individual's vulnerability to disturbances (such as snoring or toilet visits of a partner), which may lead to sleep deficiency and subsequent impairment in daily function (Smith et al. 2017). Research has demonstrated relationships between sleep and environmental aspects of the sleep environment but, to-date, little attention has been paid to other aspects of co-sleeping that influence the quality of sleep. Internationally, approximately half of pet owners share their bed or bedroom with their pets (Smith et al. 2017). Industry reports suggest that the practice of having a dog for a pet is common and growing (Walden 2015). For example, 32% of Canadian households have one or more dogs (Consumer Corner 2014) and as many as 90% of pet owners identify their pets as a family member and include them in as many aspects of their lives as possible (Ferrie et al. 2011; Walden 2015). For many, including people with sleep problems and people with pain, this includes sharing a sleep environment (Duthuluru et al. 2014; Krahn et al. 2015). A study of 300 patients with sleep disorders found that 52.3% participants had one or more pets, primarily cats and dogs. Of these participants, 58% slept with their pets in the bedroom (Shepard 2002). While there is a strong body of evidence reporting that dogs are beneficial for general health (alleviating daily stresses, reducing anxiety, loneliness and depression, enhancing feelings of autonomy, competence and self-esteem, facilitating social interactions between people and increased physical activity) (Cutt et al. 2007; Duvall Antonacopoulos and Pychyl 2017), there is limited literature exploring how the presence of pets in the bedroom affects an individual's sleep (Duthuluru et al. 2014; Wells 2009). An Australian online survey of sleep wellness compared pet owners who slept with their pets and those who did not (Smith et al. 2014). Of the 2036 participants, 1018 (50%) allowed pets to sleep with them in bed. There was no significant difference reported in sleep quantity between those who did and did not sleep with their pet. However, although the effect size was small, there was a difference of 4.07 min delay for pet co-sleepers to fall asleep and these participants were also more likely to report feeling tired upon waking. There was no difference in reports of daytime fatigue. Additionally, participants who co-slept with pets were no more likely to report waking up from sleep disturbances than those who did not co-sleep with pets. Of note, participants with health conditions were more likely to sleep with a pet in their beds than those who did not (59% and 41% respectively) (Smith et al. 2014). One of the few studies to use an objective sleep assessment tool (actigraphy) to collect data on human/pet co-sleeping variables included 40 healthy adults with dogs over six months of age. Participants wore an Actiwatch 2, while their dogs wore a FitBark dog activity monitor for seven nights. Findings revealed that participants with a single dog in the bedroom but not on the bed, maintained good sleep efficiency (ratio of time in bed to time asleep) but sleep efficiency decreased significantly (83.1% and 80.1% respectively; $p = 0.003$) when dogs slept on the bed. This suggests that the problem for sleep efficiency is not so much human/pet co-sleeping, but rather a dog's position on or off the bed (Patel et al. 2017).

1.1. Sleep-Negative Influences of the Human/Pet Relationship

Some disturbances in sleep while co-sleeping with a pet are linked to mismatches in human/pet core body temperatures and the different sleep-wake cycle between humans and dogs (Campbell and Tobler 1984; Smith et al. 2017; Thompson and Smith 2014). Sleep disturbances may also occur given dogs' responsiveness to auditory stimuli regardless of whether in a sleep state or an active state (Adams and Johnson 1994). In the Shepard (2002) study, 53% of the participants who slept with a pet in the bedroom considered their sleep to be disturbed most nights. The most common cause of disturbance dog owners in the Shepard (2002) study identified was that the pet snored (21%). Other risks to restorative sleep presented by human/pet co-sleeping (such as immunologic responses leading to allergies or asthma, transmission of zoonotic agents, bites and scratches causing tissue damage and pain, and the behavioral and toileting issues of young dogs) are considered to be relatively low if dogs are routinely bathed, provided with required veterinarian care, and properly trained (Campbell and Tobler 1984). A survey by Wells (2009) of 168 patients with chronic fatigue syndrome,

aged 45 and over, found that of the 58.3% who had a pet, 41.8% reported disadvantages (including increased fatigue due to pet-care demands, expense, disruptions to sleep during the night, behavior problems, bereavement following pet loss and increased worry and stress when ailments occurs). Finally, as noted previously, sleeping with a pet on the bed may also delay sleep onset by several minutes (Smith et al. 2014).

1.2. Sleep-Positive Influences of the Human/Pet Relationship

Pets are commonly seen as members of the family and telling individuals to stop sleeping with a pet can be the same as telling individuals to stop sleeping with their partner or children (Patel et al. 2017; Rose et al. 2015). Belk (1996) reported that pets are seen to make life interesting and are a source of entertainment. Thus, pet owners often tolerate mischief from their pets and are willing to change their lives and schedules to accommodate their pets.

In a 2015 study, involving 150 patients with significant sleep disorders, 49% of participants reported having pets and of these, 56% allowed pets in the bedroom. While 20% described their pets as disruptive to sleep, twice as many (41%) perceived their pets as unobtrusive or beneficial for sleep (Krahn et al. 2015). Participants who described their pets as beneficial, especially those who did not co-sleep with a human, reported that their pets provided them with security, companionship, and relaxation that aided their sleep. Similarly, in the Wells (2009) study cited previously, all of the participants who owned a pet made positive comments and attributed pet ownership with a wide range of advantages for health and physical and psychological well-being including; companionship, emotional bond, decreased loneliness, better mood, reduced depression, increased sense of calm and a sense of purpose, and distraction from worry about health concerns. The role pets played in motivation to get out of bed (keeping to a regular schedule) and encouragement to take exercise, both considered to be important contributors to restorative sleep, were also frequently mentioned. The link to psychological well-being has been identified in additional studies (Beetz et al. 2012; Cassels et al. 2017; Irvine and Cilia 2017) and some researchers suggest that pets can play a transitional role at bedtime, triggering a sense of routine, order and security, thus easing the path to sleep (Wells 2009).

There is also an aligned but distinct, growing body of research regarding trained service dogs. While our primary concern relates to pet dogs, some brief mention of studies of service dogs specific to sleep is warranted. A 2015 literature review (Rose et al. 2015) identified several small pilot and case studies specific to service dogs and sleep. One study cited in the review used dogs to intervene by awakening participants during a sleep apnea event and thus helping reset heart rate and facilitate reoxygenation (Smith et al. 2017). A second study trained service dogs, owned by persons with post-traumatic stress disorder, to wake their owners to preclude the onset of nightmares (Marston and Kopicki 2015). A third study involved training dogs to wake post-traumatic stress (PTSD) patients before the onset of nightmares and to provide comfort after a nightmare (Rose et al. 2015). The literature also contains reports of service dogs being trained to provide up to a five minute warning of an impending narcolepsy attack so patients can take precaution to minimize risk of injury during a fall (Dominguez-Ortega et al. 2013), and to place themselves in front of patients to avoid danger, call 911 from a specially designed phone, retrieve medication, and to cue patients to take medication (Roy 2014). These studies highlight that, in certain conditions, some disturbances during the night may be beneficial. The literature seems promising and suggests that the practice of co-sleeping with a dog may be a valuable non-pharmacological treatment option for some individuals with sleep disorders (Rose et al. 2015). However, service dogs are not readily available nor affordable for most people and research into the influence of sleep consequent to human/pet co-sleeping should not be neglected.

In summary, the question of animals in the sleep environment is complex. Undeniably, there are disadvantages for some people who co-sleep with their pet dog (Thompson and Smith 2014). However, research is growing identifying that having a pet in the bedroom or on the bed can have advantages such as feelings of security, contentment and relaxation, and especially for those who do not co-sleep with another human. Many pets are a source of unconditional support, comfort, security

and stability (Crowe et al. 2017; Giaquinto and Valentini 2009; Smith et al. 2014) and, for some people, the advantages of human/pet co-sleeping likely outweigh the disadvantages (Smith et al. 2017).

While we know that in the general population co-sleeping with a pet appears to be common practice, there is little research available focused on persons living with chronic pain. Being told by a healthcare provider to discontinue co-sleeping with a pet dog, on the basis of the current evidence shortfall, can potentially be stressful and unnecessary. It may also increase a pain patient's feelings of isolation and being a burden to other family members who may have to take on more nighttime dog care responsibilities. Addressing the current evidence gap will assist healthcare practitioners and pain patients who wish to practice human/pet co-sleeping, develop strategies for optimal sleep outcomes (Krahn et al. 2015). The specific aim of this study is to explore chronic pain patients' experiences and beliefs about the impact of their pet dog(s) on their sleep.

2. Materials and Methods

2.1. Design

The participants in this paper were part of a larger study (Carr, et al. in press), which used a sequential exploratory mixed methods design (Creswell 2003; Creswell et al. 2011) where the qualitative phase is followed by a quantitative phase. The qualitative study, reported elsewhere, explored the experiences of people with chronic pain related to pet dog ownership (Carr et al.). The sleep question was only added to the larger study towards the end and resulted in a subgroup of participants (seven in total) who were specifically asked during the larger study interview, "Does your dog have a positive or negative impact on your sleep?" The larger qualitative study recruited participants (including the subgroup reported here) from a major chronic pain management program in Western Canada. The study had ethical approval from the University of Calgary Conjoint Health Ethics Research Board (CHREB#16-2040).

2.2. Participants

The larger qualitative study used a purposeful sampling strategy to recruit participants best able to provide rich qualitative data (Creswell 2003). To capture a range of experiences, participants were recruited between the ages of 18–90, who had lived with chronic pain for \geq six months measuring \geq four on a Visual Analogue Scale (VAS, 0–10mm), at the time of invitation to the study. This criteria for having lived with pain for six or greater months aligns with the operational definition of chronic pain. Participants must also have owned a dog at the time of the study, been able to provide informed consent and converse in English. During later stages of the iterative data analysis, the relevance of a sleep-specific question was identified and added. Consequently, we have a smaller number of participants who responded to the sleep specific question than in the larger study. However, qualitative research methodologists suggest that 6–20 key informants are adequate for achieving data saturation (Creswell 2003), and we believe that the seven participants, who were asked the sleep specific question that is the focus of this paper, provided significant, rich and relevant data.

2.3. Recruitment and Data Collection

The larger study recruited participants through flyers and posters displayed in high traffic areas of a major chronic pain management program in Western Canada. No incentives were offered. Interested patients who owned a dog contacted the research team and, if they met the inclusion criteria, they were sent a consent form by mail or email and a convenient time scheduled for the interview. The main data collection method was a digitally recorded semi-structured telephone interview. For all study participants, the interviewer (EC) asked participants to reflect on their personal experiences of living with chronic pain and how having a dog affected how they experienced and managed chronic pain. In addition to those questions, the subgroup reported in this paper (seven in total), were also asked specifically, "Does your dog have a positive or negative impact on your sleep?"

2.4. Analysis

Verbatim transcripts were scanned electronically for any mention of the keywords “sleep, rest, naps, insomnia.” Given the emerging research linking daytime activity to restorative nighttime sleep (Moules 2002), we also searched for data specific to participation in daytime walks with the dog. Relevant text was extracted, and, following repeated readings, comments were coded and then organized into categories (Bowling 2002). A sample of the transcripts (15%) were read, coded and categorized by a third party, not involved with the study, to audit for coding consistency. No discrepancies emerged.

3. Results

Six women and one man, all with chronic pain, responded specifically to the impact of their pet dog(s) on their sleep. Participants ranged in age from 45 to 70, had lived with pain for between 8–30+ years and six participants were not working or were retired. Five participants lived with a partner. Five participants had one dog and two participants had two dogs. The dogs aged in range from under 1 year to 10+ years (Table 1). The age and breed of dog was not specifically recorded unless mentioned by the participant. A number of participants’ comments reflected that they allowed their pet dog to sleep in the bed with them but, as we did not ask this question specifically, it is not possible to determine if this was common practice or if the pet sleep in the bedroom but not on the bed.

Table 1. Participant demographics.

Participant (Gender)	Age	Employment	Living Arrangements	Duration of Pain	Number of Pet Dogs	Age of Dog (years)
1 (F)	67	Not working	Partner	22	1	8
2 (F)	45	Not working	Partner	12	1	2
3 (F)	45	Part-time	Partner	20+	1	7+
4 (F)	55	Not working	Alone	8	1	2
5 (F)	68	Not working	Partner	30+	2	u/k
6 (F)	55	Not working	Alone	8	1	10+
7 (M)	70	Not working	Partner	30+	2	<1, u/k

Key: u/k = unknown

3.1. Codes

The emergent codes reflected three categories: positive, negative and reciprocal beliefs held by participants in relation to the impact on their sleep of having a pet dog.

3.1.1. Category 1: Positive Impact

Over 80% of the comments reflected the belief that owning a dog had a beneficial effect on sleep (Table 2). The five codes in the category of Positive Impact and illustrative comments from participants [P], are listed below.

1. Physical Presence/‘Cuddles’

Participants identified that the actual physical presence of their dog was reassuring, prevented loneliness and reduced stress so that sleep onset was easier; “... I’ve got my buddy and I’ve got my companion hanging out with me and I don’t get that loneliness” [P2] and “... when I am not well he is there for comfort ... you know I always have got somebody to cuddle and make me feel loved when I am lonely and in pain and when I am trying to sleep ... ” [P3].

2. Routine and a Schedule

The role having a dog played in setting a routine that was linked to sleep was mentioned several times; “... it helps in some way for the cuing... the thing they do for my sleep is the pattern of sleep

to go to bed . . . ” [P4] and “ . . . it’s time to go to bed. She [the dog] knows what the phrase means. It is obvious as she’ll get up and walk up the stairs. She’ll walk 2–3 steps and look at me like ‘are you coming?’ [P7].

3. Distraction from Anxiety/Reassuring Presence at Night

Three participants explained that their dog played a role in reducing psychological anxiety, stress and fear prior to bedtime; “ . . . I get anxiety attacks/ anxiety moments, and, you know, he can’t help stopping my mind from racing . . . it’s that comfort and knowing that he is there and even if I am awake all night I have company . . . ” [P3]. Similarly, Participant 5 stated “ . . . she [the dog] is just like a really solid friend . . . she is there and she listens. She listens when no one else is around.”

4. Active Intervention to Keep Participant Safe

Several participants talked specifically about perceptions that their pet dog took active intervention when the participant was experiencing challenges to restorative sleep. For example, Participant 2 reported that her dog seemed to monitor her pain medication pump and alerted the participant and her partner if there were problems, “ . . . she came and woke my husband up seconds before an alarm went off on the pump, like seconds.” Similarly, Participant 6 said, “ . . . she can tell when I am still asleep having a night terror . . . she will nuzzle up. I don’t know what I would be doing without her, I wouldn’t be sleeping.”

5. Daytime Activity to Promote Being Tired at Night

Most participants mentioned that their dogs increased their activity during the day that contributed to better sleep; “ . . . my days revolve around lots of walking with the dog . . . [P2]. Participant 1 spoke of how her daytime activity increased dramatically as she cared for her dog with very complex health needs. She stated “ . . . I think he was a real gift . . . because of him and looking after him, you know, feeding and medication and then we started therapy . . . over the next four months I got feeling better and got out of the house and had to do stuff for him and walk him”

3.1.2. Category 2: Negative Impact

Only two participants mentioned having their sleep disrupted by their pet dog, and, for the most part, these comments did not reflect that participants believed this to be a particularly troubling aspect. Rather, it was most common for participants to bracket these comments about their sleep being disturbed by jokes or statements intended to balance the negative aspect. For example, Participant 3 stated, “ . . . if they [the dog] decide they are not going to be sleeping that night they are gonna bug you and wake you up and, you know, be a bit naughty. I get that too. But it’s not every time with him and generally he is pretty good about letting you rest, it was definably a comfort when I was on my own because I was lonely and he helped me sleep.”

3.1.3. Category 3: Reciprocal Impact

Interestingly, a third thematic category emerged reflecting several participants’ reciprocal concern for the sleep of their pet dog. As opposed to expressing concern for their own sleep being disrupted they talked about their strategies to help their dogs who had pain or illness to get a better sleep. For example, Participant 5 talked about her dog having a lot of joint pain: “ . . . she [the dog] has days when she experiences lots of pain, I make myself get down on the floor at her level I will sit with her and talk with her and very softly, very calmly, I make a point of massaging her ever so gently . . . I find this brings down her heart rate, she’s not in pain, the pain is starting to go down. I can physically see the changes in her and eventually she nods off to sleep.” One participant pointed out that human/pet sleep disturbances were also reciprocal, stating “ . . . if anything I disturb their sleep . . . he helps me get the little bit of sleep I get” [P4].

Table 2. Categories of codes from statements specific to dogs and sleep.

Category	Code
1. Positive	Physical presence/"cuddles"
	Routine and a schedule
	Distraction from anxiety/reassuring presence at night
	Active intervention to keep participant safe
2. Negative	Daytime activity
	Disturbs sleep with toileting or play demands
3. Reciprocal relationship	Owner concerned over pet dog's sleep

4. Discussion and Conclusions

We know that sleep, like pain, is best understood through the application of a biopsychosocial lens (Ferrie et al. 2011). Additionally, there is growing evidence that sleep and pain have a bidirectional relationship such that it is reasonable to assume that improved perceptions of sleep may positively influence how a patient experiences pain (Finan et al. 2013). If this, as the evidence seems to suggest, is the case, it is essential that we apply a much more comprehensive examination to the factors affecting both the perceived and measured outcome of sleep for persons living with chronic pain. To-date, most advice about how to improve sleep takes a fairly simplistic approach to managing sleep problems in the presence of a pet; remove the pet (American Sleep Association n.d.). However, removing distractions is only one of a multitudes of sleep hygiene principles. Sleep hygiene also stresses the importance of daytime activity, daylight exposure, stress reduction, and daily routines (National Sleep Foundation n.d.). Participants offered numerous examples of how their pet dogs facilitated adherence to these principles. Based on these findings we believe that more detailed research is warranted into the role pet dogs play in helping with sleep onset and maintenance through both physical (increased daytime activity, monitoring of breathing and other sleep-related technology) and psychological (maintenance of habits, routines, roles and responsibilities, stress/anxiety reduction, sense of safety and companionship) components of sleep hygiene. Additionally, the findings related to the concern some participants expressed about disturbing their pet dog's sleep were particularly intriguing and require further, more nuanced, study. It may be that some elements of social contract theory are at play and participants' comments reflect a sense of obligation towards the pet dog who is providing emotional resources to the owner. We do not have sufficient data from this study to speculate further but will look to social contract theorists such as Palmer (1997), to guide further research in this understudied area,

Chronic pain is a complex, biopsychosocial condition (Brown 2009) and privileging biological interventions alone is inadequate. We need to better understand if removing pet dogs as a solution to improved sleep could be counter-productive and lead to more, not less, sleep-related issues, including the potential for increased reliance on sleep medication and the increased need for other costlier, demanding, and less accessible, interventions such as cognitive behavioral therapy and pain-related surgery.

There were limitations to the study; with the small sample the analysis may not have reached thematic saturation, and it is possible that collecting phone interview data about sleep at the same time as other aspects of pet ownership and pain introduced some fatigue in participants and some responses may have been less detailed than optimal. Also, the participants self-selected and were therefore likely to be more positive about the aspects of dog ownership in their lives. Additionally, we did not collect quantitative sleep indicators which would have built a better picture of the extent of sleep deficiency in these participants. However, a number of sleep-positive codes emerged and even the two participants who identified negative aspects of co-sleeping with their dog unfailingly bracketed those comments with humor and other examples of where the dog was a sleep-positive influence.

Sleep is an essential human requirement, which, for many people with chronic pain, is a significant challenge. The evidence-base supporting the bi-directional nature of sleep and chronic pain is clear

and requires closer attention. This small study shines a light on this important and yet neglected area of research. It reveals that for these participants their dog appears to enhance their sleep in many ways. Further research is warranted to explore more fully the ways in which pet dogs influence sleep for people with chronic pain.

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