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Trabajo de fin de Grado en Veterinaria:

Pain measurement scales in domestic animals: a review

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ABSTRACT

Concern for animal pain has increased exponentially over the years, and studies have significantly enhanced our understanding of how pets experience and express pain. The welfare of our pets is closely tied to this knowledge, and addressing animal pain is a crucial aspect of veterinary ethics. Effective pain management begins with the accurate identification and quantification of pain. This review focuses on this critical first step, providing veterinarians with the tools to manage and alleviate pain in domestic animals.

This bibliographic review analyzed 30 articles from Web of Science, focusing on the identification and quantification of pain. The search targeted studies related to dogs and cats, exploring topics such as the origin of pain, its consequences, various methods to measure it in both species, and the implications for anesthetist's work. Additionally, the review examined the current status of this tool's usage.

After extensive research, first it has been revealed that there is a wall between the identification of pain and its resolution, reaching analgesia regardless of the patient's pain level. To tear down this wall, tools are being developed to relate pain intensity to appropriate patient-specific management, methods that focus primarily on how these animals externalize pain through facial expressions or behavioral changes, even though there are other ways to identify it.

Following the search, the conclusion obtained was that the tools that have been refined to identify pain are highly effective, versatile, and simple to use.

This field of science has only just started to be studied and has a thriving future. This promising future is supported by emerging studies, and by owners and veterinarians who seek the best possible welfare for our pets.

Keywords: Pain, measurement, dogs, cats.

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1. INTRODUCTION

In 1979, the International Association for the Study of Pain introduced a revised definition of pain after a two-year review process. This definition is: "*an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage*" (IASP).

Nevertheless, it gives too much importance to self-evaluations and oral expression, so it makes a gap to extrapolate it to pet's world. So, when it comes to veterinary, there is no universal definition of pain approved by the world of animal wellbeing. Therefore, for this review, the most proper definition would be the one provided by Molony (1997) that defines pain as: "*an aversive sensory and emotional experience representing an awareness by the animal of damage or threat to the integrity of its tissues. It changes the animal's physiology and behavior to reduce or avoid the damage, to reduce the likelihood of recurrence and to promote recovery*".

Further elaborating on the subject and as a benefit for the veterinarians, the neurophysiological functions involved in detection, transduction and transmission of noxious information reached by nerves and their next steps until reach the central nervous system appears to be essentially similar in all mammals. This helps practitioners to extrapolate medicine knowledge to our world. However, it is still not clear to what degree different species feel pain with similar quality and intensity (Merola & Mills, 2016).

Once the pain originates, the next differentiation that must be made is the distinction between acute pain and chronic pain. Both are different clinical entities and have different consequences for our pets.

First of all, acute pain has the function of protection and represents an adaptive response to damaging or potentially damaging stimuli. This pain is generally related to skeletal muscle spasm and activation of the sympathetic nervous system and is usually self-limiting. On the other hand, chronic pain may be considered a disease state because it is pain that lasts longer than normal time of healing. Contrary to acute pain, chronic pain may come up from psychological alterations, and it is not self-limiting.

Indistinctly from chronic and acute pain, there multiples etiologies of pain such as: neuropathic, nociceptive, musculoskeletal, inflammatory, psychogenic, and mechanical. It could be also classified as somatic pain (originated in the skin) and deep pain (originated in muscles, bones, joints, or connective tissue). Somatic pain refers to pain originating from the periphery and can be well localized in most cases. Visceral pain arises from viscera which are related to mechanical, thermal, or chemical stimuli, predominantly sensitive to distension of hollow muscular-walled organs and to inflammatory mechanisms (Landa, 2012).

Once the concept of pain is defined and understood, it will be related to veterinary medicine, taking the first steps towards its identification in the history and physical examination of the patient. These steps should include onset of pain, description, mechanism of injury, if possible, region affected, quality, intensity, factors contributing to alleviating or worsening the pain, recurrence of the pain, and any advancement.

As a second step, it is important to know that pain, as a resort combination of different physiological and multidimensional elements, has its consequences when not mitigated. Such as suffering, distress, and detrimental effects in physical health could be symptoms of untreated pain, representing a welfare concern for practitioners and an important discomfort for their owners. Pets can also induce catabolism, impair respiration, delay wound healing, prolong periods of hospitalization and increased morbidity and mortality (Cambridge *et al.,* 2000).

Continuing with the consequences, prolonged states of pain can interrupt the wellbeing of a living being (including small animals), affecting the day to day, activities of daily living and quality of life. Some questions could be asked to understand how far pain is reaching, such as: is pain affecting the day to day of the domestic animal? Does the owner find his pet sad? Is it able to sleep throughout the night or exercise regularly? Are the activities of daily living affected, such as toileting, walking, playing, or eating limited or restricted?

By adhering to ethical values and the ethical code of conduct, is a concern for veterinarians and a must to identify, quantify, and treat pain in any domestic animal.

This way, it will improve a patient's function and the quality of life of their patients and their owners.

Knowing this, it is a worry both for owners and veterinarians that pain appears in pets. Aware of that and with the advance veterinary medicine suffers daily, there is still a gap between pain diagnosis, measurement and management and its execution. Professionals of the sector can and should embrace the fundamental principles of clinical bioethics, adapted from human medicine, and use them for the benefits of domestic animals avoiding all these consequences of pain.

As explained above, pet pain is not simply a physiological issue. Also, from a bioethical perspective, veterinarians must reaffirm their commitment to bridging the gap between knowledge and the care they provide to their patients in pain.

A useful way to close this gap is the use of the pain scales that help us in the measurement of pain. These tools are still under development, but it is demonstrated that their use is a powerful way to assess and measure pain. Therefore, choose adequate treatment and doses to relieve this pain and avoid all its consequences, seeking for the best possible welfare for both patient and owner.

As a resume, given the importance of the consequences of pain in the veterinary clinic, it is utmost important to understand in the best possible way the relationship between pain and its management. Thus, for good management it is essential to know the wide variety of intensities that can exist against the sensation of pain. In this way veterinarians can apply the best possible treatment for the idiosyncrasy of each patient.

Finally, the main focus of this review is to study these methods and demonstrate their usefulness to increase acceptance and their integration in daily clinical practice, which will help to improve pain management and to avoid all these undesirable side effects derived from the presence of pain.

2. OBJECTIVES

- To define the physiological, biochemical, and behavioral basis of pain for a better understanding of pain in animals.
- To raise awareness among veterinarians about the importance of pain in domestic animals and their consequences and understand the relevance of its appropriate treatment.
- To conduct a systematic review of the different methods to measure pain in both dogs and cats.
- To discuss their reliability, usefulness and effectiveness in day-to-day veterinary practice and find out how much these scales are being used to promote them among veterinarians who do not measure pain in domestic animals.
- To understand the scoring of the scales and relate them to a determinate critical point of pain for a specific management of each patient.
- To evaluate the different methods and scales that exist in veterinary medicine to assess pain in domestic animals, to compare them and to study which of them is the best suited to each situation presented in veterinary clinics and hospitals.

3. METHODOLOGY

This analysis employs a systematic literature review methodology, which uses structured and transparent methods to identify, gather, and synthesize all relevant evidence regarding a specific research question. Unlike traditional literature reviews, which may be subjective and selective, a systematic review comprehensively and objectively searches for all relevant studies that meet predefined criteria.

The selection of the articles for this review was conducted in April 2024 using the robust search engine, Web of Science. This online platform provides access to a wide variety of scholarly resources, including citation databases, scientific journals, books, and conferences. The filter used for the search was:

“(Pain) AND (measure* OR assess* OR scale*) AND (dog* OR cat* OR domestic animal* OR small pet)”.

In addition to these filters, it was decided to use only information from articles or studies to ensure the review was conducted in a more objective manner. Furthermore, only articles in English and from the year 2000 onwards were chosen. This approach was intended to provide a better understanding of the subject and to offer up-to-date information, as this topic has gained significant attention and research interest in recent years.

Thus, we obtained 74 articles containing the keywords and matching our criteria. From these 74 articles, 38 were selected. The rest of them were discarded by multiple reasons:

- 25 articles mentioned the scales and the results obtained but did not provide additional valuable information on the scales themselves, they were focused on demonstrating the effectiveness of a drug or other methodologies against pain.
- 7 articles were focused on using these scales to measure pain on a specific disease or within the degrees of the same, so they did not provide valuable information for the knowledge of these scales, they only named the scale and the score obtained. Articles selected already demonstrate the utility of these scales for this purpose, so it is already mentioned.

- 2 articles were focused on other species.
- 1 was a magazine number.
- 1 was a survey of the students at a university, not an article itself.

From the 38 selected articles, 8 of them were discarded by the following reasons:

- 5 articles used scales to measure other parameters (lameness and quality of life).
- 3 articles were in another language, all of them in Portuguese, which did not meet our selection in criteria.

After this, a selection of 30 articles were made to develop this project.

Finally, regarding data extraction, the primary information obtained was focused on the use and functionality of these scales, as well as the results obtained in their application in veterinary hospitals and clinics. In this way, knowledge was obtained on the specific methodology of each scale and its usefulness in the daily practice of veterinarians for each specific case. Additional information was also obtained on the physiology of pain, its consequences, and bioethical implications as well as its current use in daily clinical practice.

4. RESULTS AND DISCUSSION

Evaluation and measurement of pain in domestic animals is essential to establish the appropriate treatment that will take care of its wellbeing and optimize its health. The fact that the veterinarian's patients do not talk poses a challenge to quantify the pain that the pet is feeling and therefore it is difficult to adjust an adequate treatment for the uniqueness of each case (e.g. drug and dose) (Menendez *et al.,* 2023).

To understand the seriousness of this problem it is necessary to know the main consequences of an underdiagnosed or undervalued pain, such as: activation of the sympathetic nervous system, increased morbidity and effects on disease progression, suppresses the immune system increasing susceptibility to infections, altered metabolism, impaired and delay recovery from illness, injury or surgery by interfering with the healing process among others (Spahija *et al.,* 2023). Pain can also influence the physiological function of different body systems through modifications in the hormone tissues, neurotransmitters, and enzymes pain. Besides, neural processes activated by pain such as sensitization may develop. This pain involves surgical pain too, since an adequate pain assessment improves postsurgical sequelae and recovery time after surgery (Menendez *et al.,* 2023).

Consequently, one can deduce the great importance of effective pain management and treatment, aiming to avoid all these physiological consequences that pain brings. Following body temperature, heart rate, blood pressure and respiratory rate, American Pain Society (APS) consider "Pain as the fifth vital sign", therefore it must be an integral part of every physical examination (Menendez *et al.,* 2023).

Fortunately, professionals have some tools to measure this parameter. What is being looked for with these validated tools is to assess in the most objective way the pain suffered by domestic animals, especially concerning cats, which will be understood below.

4.1. Bases of pain scales:

Tools to measure pain differ greatly from each other, being invasive, non-invasive, more or less reliable, fast or slow, but all of them aim to quantify the pain suffered by an animal, to be able to adapt the treatment or not and return to the state of well-being veterinarians are looking for. So, attempts to identify criteria to develop these techniques and to measure pain have reached guidelines to recognize this condition based on physical and biological alterations such as behavior, facial expressions, physiological parameters, and biochemistry mediators. Although, they have not been consolidated as universal pain factors because it is impossible to apply only one parameter to all species due to variations existing between one species and another, even in the same species. Thus, pain is ponderable within its broad spectrum and by means of different techniques that are adapted to each animal species (Hernandez-Avalos *et al.,* 2019).

It is worth noting that every species can suffer different and unique physiological and behavioral changes in response to pain, which makes it difficult to establish a unique and universal method and assess pain for animals. Additionally, the incapacity of animals to speak makes it necessary to use indirect indicators. Besides, countless anatomy and physiological differences of every species requires the adaptation of techniques of pain assessment, to allow a precise evaluation in every one of them (Spahija *et al.,* 2023). Indirect indicators that have been used by different studies to know the best way to measure pain are the following:

4.1.1. Physiological parameters

When pain originates, physiological parameters such as heart and respiratory rate, pupillary diameter and blood pressure suffer modifications in an autonomic response to nociception. Although, these variables are affected by many other factors like fear or stress, which makes them not valid as singles parameters to assess pain reliably. Some authors suggest using them as bases to recognize the starting of a painful process, which are mydriasis, tachycardia, tachypnea, and arterial hypertension. In the case of small animals with chronic pain, these physiological aspects tend to be less evident (Hernandez-Avalos *et al.,* 2019).

Sylvain *et al*. tried to establish a connection between intraoperative nociception and certain respiratory indicators, suggesting that nociception might impact the rate of inspiratory gas flow and the proportion of inspiratory time in anesthetized canines. Nevertheless, the considerable variations observed in the results, among individuals, imply that these respiratory indicators may not effectively discern the presence or absence of intraoperative nociception (Di Bella *et al.,* 2023).

Another important point that must be mentioned is monitoring perioperative pain, the fundamental objective of the veterinary anesthesiologist, avoiding postoperative discomfort. Anesthesiologist job is based on detecting hemodynamic reactivity, whose manifestation of pain is through tachycardia and increased blood pressure, respiratory patterns, or muscle tone. As a disadvantage, parameters can be modified by the administration of anesthetic drugs, so they are not only related to pain and reinforcing the fact that they cannot be used as exclusive measures of pain (Hernandez-Avalos *et al.,* 2019).

When taking into consideration the findings of the studies conducted by Hernandez-Avalos *et al.* (2019) and Di Bella *et al.* (2023), it is concluded that these parameters are direct indicators of pain and that although they are used, especially in intraoperative anesthesiology, they are not the most accurate for this purpose since they are variables influenced by other factors, such as drugs, and can lead to confusion.

4.1.2. Endocrine parameters

Hormone and endocrine variables are an interesting way to try to find out the pain that an animal is feeling. One of these hormones are β-endorphins, an endogenous opioid whose released is believed that occurs in stressful situations, which can be related to the sensation of pain. An essay studied this β-endorphins by quantifying them from blood samples in 3 equal groups of cats: a control one (no pain suffered), cats after tenectomy and cats after onychectomy (two painful surgeries). Results showed that no β-endorphins concentration varies significantly among the 3 groups, which makes β-endorphins as non-useful tool to evaluate pain in animals (Cambridge *et al.,* 2000).

Another interesting molecule is lactate, that has been analyzed as a parameter to determinate severity of tissue damage derived from hypoxia or ischemic processes, so it has been associated with pain. Results of studies showed that its elevation can depend on catecholamine production, so its variation may appear in an animal without pain (Hernandez-Avalos *et al.,* 2019).

The same thing happens with cortisol that is intimately related to acute and chronic pain but also to stress, ethological alterations, life quality or psychogenic stress (Markovszky *et al.,* 2020). To confirm this fact, a study was developed consisting of 10 dogs that were inducted of synovitis via intra-articular injection of sodium urate into the left stifle joint. Cortisol was measured from blood samples by chemiluminescent immunoassay before the induction, 1.5, 5, 4.5 and 10 hours after induction. During the control study, results obtained showed that cortisol concentration did not change significantly over time. Data collected before and after the period of synovitis were statistically like data collected during the control study (pain-free dogs) (Feldsien *et al.,* 2010).

A study conducted by Markovszky *et al.* (2020) developed cortisol research with the intention of determining serum cortisol level to demonstrate if it can be used to measure pain. A total of 30 dogs were grouped in pain-free (10 dogs) and painful dogs with confirmed pain of the locomotor system (limbs, vertebral column, or combined) (20 dogs). The painful group were handled in two ways in groups of 10 dogs, one group treated with Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) and the other one with therapy and physiotherapy. Cortisol was measured in all dogs at the beginning of the investigation and after ten days of medication, alone or associated with physiotherapy. Hormone was analyzed by electrochemiluminescence immunoassay (ECLIA). The results were as follows in the three groups:

- From the control group, 9 out 10 dogs had normal serum cortisol levels, and one sample was under the set limit in the second sample, a variation in a pain-free dog throughout the trial.
- From the NSAIDs group, six out 10 dogs had lower levels of cortisol in the first sample compared to the one measured after treatment, even having a higher level of pain in the first sample (cortisol could provide negative feedback to the hypothalamic pituitary in chronic pain).

- From the drugs and physiotherapy group, even though the symptoms improved significantly or disappeared, values in 5 dogs were higher in the second sample compared to the first one, even with less pain and fewer symptoms at the time of the second sample collection.

Thus, both Markovszky *et al.* (2020) and Feldsien *et al.* (2010) came to the same conclusion: individual fluctuation of serum cortisol limits is non-conclusive for the assessment of levels of real pain as a single and accurate parameter in dogs as this hormone is influenced by stress associated with blood sampling, but also by the time of the unpleasant, painful stimulus action on the animal.

Both the studies of the two previous authors together with Cambridge *et al.* (2000) and Hernandez-Avalos *et al.* (2019), it is concluded that endocrine parameters cannot be used as an exclusive measure of pain. With the exception of two studies that conclude the opposite and that will be developed later.

4.1.3. Behavioral parameters and facial expressions

In the animal kingdom, it is feasible to deduce a physical reaction to pain, triggering distinctive behaviors characteristic of each species making a way to measure pain through behavioral changes, not only as to its presence or absence of pain but also to its localization and severity. These changes that must be a focus of attention are aggression, vocalizations, self-mutilation, social interaction, sleep alteration, restlessness, and reluctance to move (lethargy) among others (Hernandez-Avalos *et al.,* 2019).

Even Darwin knew this and argued that nonhumans communicate emotions through facial expressions, which leads to an interesting question: are facial expressions involuntary and emotional or do they have a real communication purpose? (Mota-Rojas *et al.,* 2021)

It should be recalled that every species manifests their own specific behavior when feeling pain, so they are unique and not applicable to other species (figure 2) (Hernandez-Avalos *et al.,* 2019). Some examples about behavioral changes and its difference between cats and dogs are:

- Cats: reduction of activity, appetite loss, tend to hide or evade interaction, excessive licking of the affected area, interfering in their normal grooming and rigid posture in severe pain among others. It must be known that cats tend to occult pain so this behavior will be more evident if they are alone and in the presence of their owner, people or other animals could be even imperceptible.
- Dogs: exaggerated response to harmful stimuli, being aggression a characteristic of acute pain, depression (most common), submission, anxious expressions, anorexia, licking of affected area, refusal to move and when pain intensifies, vocalizations, tears, constant touching of affecting zone can be very constant and evident. Prayer position could be seen in acute abdominal pain (raising their hindquarters and keeping their heads and front limbs on the floor).

Figure 2

Interspecies differences in their behavioral parameters and facial expressions

Note. A, third eye protrusion, miosis and messy coat are clinical signs of pain in cats. B, avoiding contact or isolating themselves are classic manifestations of stress in cats; coprostasis and anorexia may also be present during painful experiences. C, depression, reluctance to move, loss of appetite, and disinterest in surroundings are typical signs of pain in dogs. D, dogs with acute abdominal pain commonly adopt a usual posture, known as the “prayer position”.

Reinforcing the reliability of the behavioral measurement of pain, it is known that animals can change their facial expressions due to painful stimulus correlated to alterations of behavior and physiological parameters. This is because the emotional state of small animals is the result of the interaction between physiological activity and cognitive evaluation of the situation. Said in another words, pain conduce to a low level of wellbeing produced by an incapacity to reach and adequate adaption that influences the physiological normality and therefore modifies behavior (Hernandez-Avalos *et al.,* 2019).

4.1.4. Organization of scales according to variables measured:

Moving on to talk about the scales, and in a simple way, pain scales can be divided into 2 groups: subjective or unidimensional scales or objective or multidimensional scales. Unidimensional means that these scales are based on a single parameter (behavior or physiological), which makes them more subjective as it cannot be related to other variable and it rely only in one aspect (Hernandez-Avalos *et al.,* 2019):

a) Preventive scoring system: this system involves an evaluator that assesses the level of pain that the process is going to cause in the animal as none, slight, moderate, or severe. It is easy to use but it does not determine the degree of pain for each patient individually.
b) Simple descriptive scales (SDS): consists of predefined categories or grades of pain, assigning a number to a category of pain so values are easily manageable. For example: 0, no pain; 1, low pain; 2 medium pain; 3, moderate pain; 4, severe pain; 5, extreme pain. The higher the number, the more difficult it is to assess the number to the symptoms. The disadvantages are that these scales do not perceive subtle changes in the intensity of pain.
c) Visual analogue scale (VAS): a horizontal line is segmented many times, so a 100-mm long line is obtained where the evaluator points where he considers the level of pain the animal is experiencing: 0 mm absence of pain and 100 mm maximum pain.

On the other hand, multidimensional means that scales consider multiple aspects, which makes them more objective and provide greater precision than the unidimensional scales because of its specificity and sensitivity level, but retains some subjectivity. As a disadvantages, the normal behavior of the analyzed animal must be known and it cannot be use in sedated animals (Hernandez-Avalos *et al.,* 2019). The multidimensional scales are the main ones and are developed in the following section.

4.2. Pains scales in dogs:

Having made an introduction to pain, its manifestations and the different methods of measurement, the study will focus on developing the methods used in dogs in more depth. It is worth mentioning that there are plenty of pain rating scales and more are emerging every day, backed by well-founded articles with many patients verifying their usefulness and validity (Morton *et al.,* 2005). This is because the scales are very adaptable and moldable. Some examples of this are the studies developed by Calvo *et al.* (2014), Brondani *et al.* (2011), and Hielm-Bjorkman *et al.* (2011). These scales base their scoring in a series of questions associated with a numerical value and depending on the result, obtaining a pain intensity or another. As said, these questions are based on multiple aspects such as behavior or physiology. Specifically, these three will not be developed due to the lack of studies that corroborate their reliability or because they are not entirely useful. Nevertheless, it is necessary to know that the appearance of new scales is not something extraordinary.

4.2.1. Glasgow Composite Measures Pain Scale (CMPS):

Is a sensitive test used regularly for acute pain in dogs and can indicate accurately the severity of pain. It is a structured, short, and simple questionnaire that must be filled in following a standard protocol by an observer. The seven items are: behavior and reactions towards people, posture, mobility, activity, response to auscultation, treatment of the painful area and vocalizations. For every item, there are specific questions selected by the similarity that the observer finds between the description and what is observed on the animal. It is a fast and easy scale to use, which

helps observer to select the right drug and dose in a short period of time relating the score obtained from the questionnaire to an appropriate drug according to the method of action in terms of duration of effect and intensity, as well as dose (Testa *et al.,* 2021).

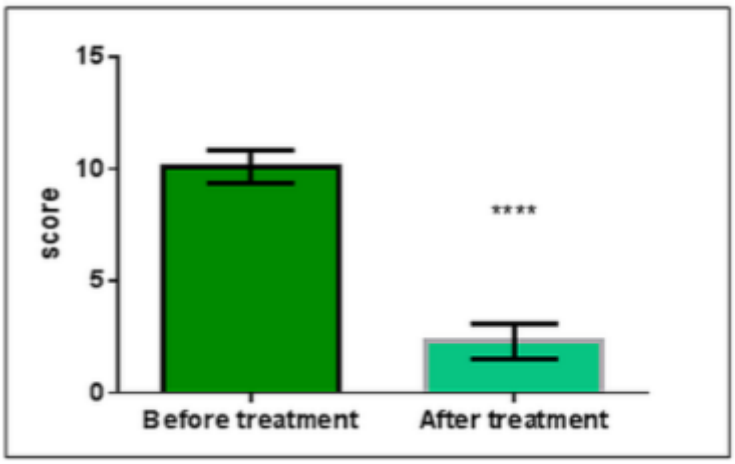
As an advantage, English version of the scale can be used by non-native English speakers thanks to its simplicity (Markovszky *et al.,* 2021). Another investigation concluded that most of the veterinarians use this scale in its basic form, but some practitioners have modified this scale to adapt it to the environment and idiosyncrasy of the case (Testa *et al.,* 2021).

Its reliability was tested by Markovszky *et al.* (2021) where the scale was given to the owners of dogs with acute pain to evaluate their dog's pain level. Results obtained were that two patients' scores from the 10 dogs used in this research were over 6, so they received a prolonged treatment and the symptoms disappeared completely after prolongation. This study has been a simple way to demonstrate the usefulness and reliability of this scale and its easy application to daily clinical practice.

The union of both conclusions of the previous authors, Markovszky *et al.* (2021) and Testa *et al.* (2021), help us to understand how useful this scale is, how adaptable it is to each specific case and how reliable it is, backed up by graphs provided by Markovszky's study (figure 3).

Figure 3

Scoring from the CMPS-SF before and after pain management with anesthetic drugs



4.2.2. Helsinki Chronic Pain Index (HCPI):

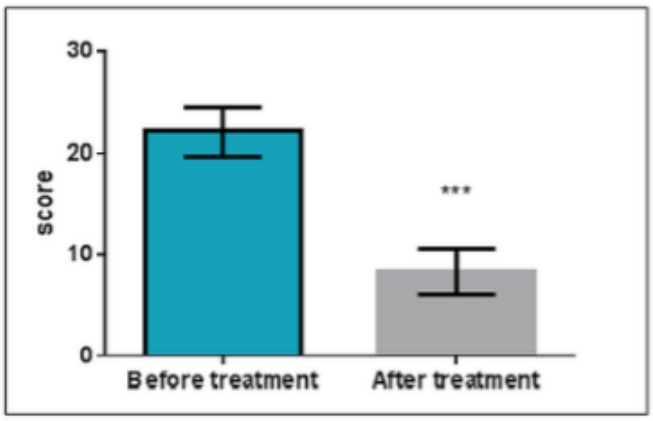
HCPI provides a scale for owner's evaluation of chronic orthopedic pain, using 11 multifactorial questions about the dog's mood, behavior, locomotion, and emotional aspect of the pain. It has been used in the assessment of chronic pain and surgical outcome in dogs with hip, elbow, and stifle joint osteoarthritis. This scale has a numerical ratio from 0 to 55 according to the answer to each question. Healthy dogs have index values up to 11, dogs with chronic pain are usually around 35 points (Morton *et al.,* 2005).

This scale was modified to adapted it to dogs that went under cranial cruciate ligament surgery. In addition to signalment information (age, breed, and body weight), asked the owners about dog's postoperative recovery with questions like the time of operation, owner's opinion of the surgical outcome, type of rupture, the duration of clinical signs before surgery, and the duration of postoperative lameness, demonstrating the flexibility of the questionnaires depending on the patient (Morton *et al.,* 2005).

This scale's reliability was tested by Markovszky *et al.* (2021), giving it to owners of dogs with chronic pain to evaluate their dog's pain level. Results obtained show accordance with the use of analgesic drugs, since all patients suffered a decrease in their score before and after analgesic treatment. This data, which helps to provide reliability to the scale, has been reflected in a graph for better understanding (figure 4).

Figure 4

Scoring from the HCPI before and after the administration of analgesic drugs



Conclusion of the research made by Markovszky was that this questionnaire could be considered a valuable tool for evaluating chronic pain and its evolution in patients undergoing treatment.

4.2.3. University of Melbourne Pain Scale (UMPS):

In an effort to develop the ordinal scale, some investigators refined the behavioral and physiological observations in various general categories and punctuation was assigned to every one of them. This tool has 6 categories focused on physiological constants, response to palpation, activity, mental status, posture, and vocalization, where every category is divided into 3 or more subcategories with a numeric value for each subcategory. For example, in the category of “Mental status”, responses are submissive, overtly friendly, wary, and aggressive, and these levels have the numbers 0, 1, 2, and 3 respectively. In total, the maximum number of the whole scale is 27 being (figure 5): 1-5 slight pain, 6-13 moderate pain, 14-21 severe pain and 21-27 unbearable pain. Thus, it is necessary to use rescue analgesia when the animal score is ≥ 10 (Hansen, 2003).

Figure 5

University of Melbourne Pain Scale

Category	Descriptor	Score
Physiological data		
a)	Physiological data within reference range	0
b)	Dilated pupils	2
c) *Choose only one:*	Percentage increase in heart rate relative to baseline	
	>20%	1
	>50%	2
	>100%	3
d) *Choose only one:*	Percentage increase in respiratory rate relative to baseline	
	>20%	1
	>50%	2
	>100%	3
e) Rectal temperature exceeds reference range		1
d) Salivation		2
Response to palpation		
a) *Choose only one:*	No change from preprocedural behavior	0
	Guards/reacts[a] when touched	2
	Guards/reacts[a] before touched	3
Activity		
a) *Choose only one:*	At rest- sleeping or semiconscious	0
	At rest- awake	1
	Eating	0
	Restless (pacing/getting up and down)	2
	Rolling, thrashing	3
Posture		
a)	Guarding or protecting affected area (includes fetal position)	2
b) *Choose only one:*	Lateral recumbency	0
	Sternal recumbency	1
	Sitting/standing, head up	1
	Standing, head hanging down	2
	Moving	0
	Abnormal posture (prayer position, hunched)	2
Vocalization[b]		
a) *Choose only one:*	Not vocalizing	0
	Vocalizing when touched	2
	Intermittent vocalization	2
	Continuous vocalization	3
Mental status		
a) *Choose only one:*	Submissive	0
	Overtly friendly	1
	Wary	2
	Aggressive	3

[a]Turning head toward affected area, biting, licking, scratching at the wound; snapping at handler; or tense muscles and a protective (guarding) posture.
[b]Does not include alert barking.

4.2.4. Dynamic Interactive Visual Analogue Scale (DIVAS):

This scale includes symptoms focused on changes in facial expression, behavior, vocalization, changes in posture, inactivity, or aggressiveness. It is a scale that goes from 0 to 100, having 40 as the reference where the patient needs pharmacological management. Its reliability has been proved to assess the effects of preemptive analgesia in ovariohysterectomy (Mota-Rojas *et al.,* 2021).

4.3. Pains cales in cats:

Accurate detection of pain is notoriously difficult, is particularly a challenge in cats because signs of pain in cats are often subtle (Cambridge *et al.,* 2000), being the recognition of pain suggested as one cause of the sub-optimal treatment of pain in this species (Holden *et al.,* 2014).

This data was demonstrated in research that showed 16 feline facials images to a group of people related to veterinary medicine (nurses, care assistant, veterinary students, interns, residents, university seniors and practice veterinarians), where 7 of them were pain-free cats (control) and 9 of them were pain suffering cats. The task was to categorize them in painful or pain-free cats. The main result was that less than 50% of the observers replied correctly, demonstrating the difficulty in pain assessment in cats based on their behavior (Holden *et al.,* 2014).

Trying to solve this problem, some studies have identified items that are considered sufficient to establish the existence of pain in cats. Some of these behaviors are reaction to palpation, withdrawing/hiding, decreased appetite, hunched posture, lowered head position, growling, groaning, eyes partially closed, decreased grooming and/or attention to the wound. Clinical experts have added to the list that cats in severe pain are usually depressed, immobile, in silent or excessive grooming, not interacting with observer, not curl up to sleep (normal behavior to conserve body heat), and “feigned sleep”. (Steagall & Monteiro, 2019).

Other important discover to fight this problem was research that found anatomical landmarks and measurable distances on two-dimensional digital faces images to distinguish between free-pain cats and painful cats. To find these anatomical

landmarks, 59 2D, front on, and symmetrical facial images of healthy, pain free cats were analyzed and compared to 28 felines undergoing postoperative care. They compared them by setting 78 landmarks on the healthy feline faces and translocating them to the painful cats. Paired landmarks are 10 in ear, 5 in nose, 11 in eyes, 4 in lips, 5 in muzzle and 1 in forehead, the other 6 are single landmarks in the forehead, nose and mouth (figure 6) (Holden *et al.,* 2014).

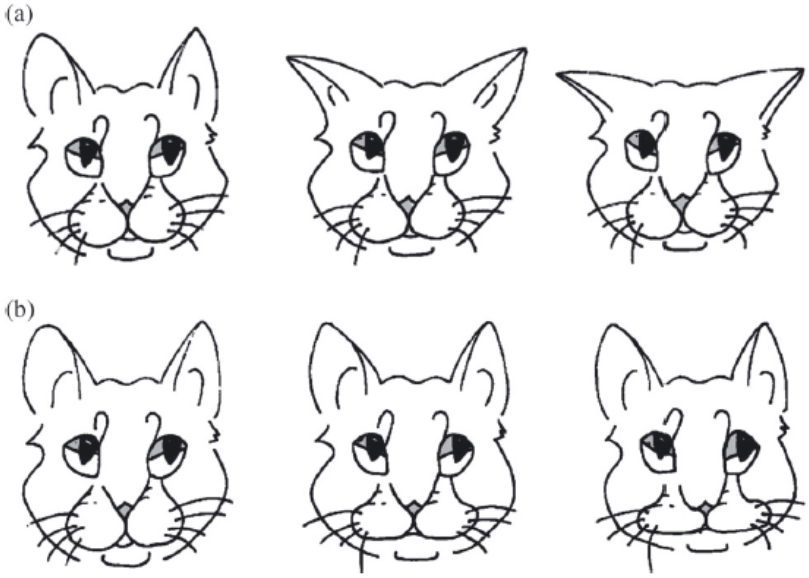
Figure 6

Landmarks established in healthy/control cats.

Results determined that individual mouth distances and 3 ear distances were statistically significantly different between both groups, and combining them, the percentage of correctly classified cats between pain-free and painful was 98%. This demonstrates facial changes in response to a range of pain in cats (figure 7) so it can be used to discriminate between painful and pain-free cats. This can be the basis for the development of new tools for pain assessment in cats (Holden *et al.,* 2014).

Figure 7

Cartoon images that show facial changes in healthy and painful cats



Note. Left are healthy cats and right are painful cats, showing changes in ears (a) and muzzle/cheek (b).

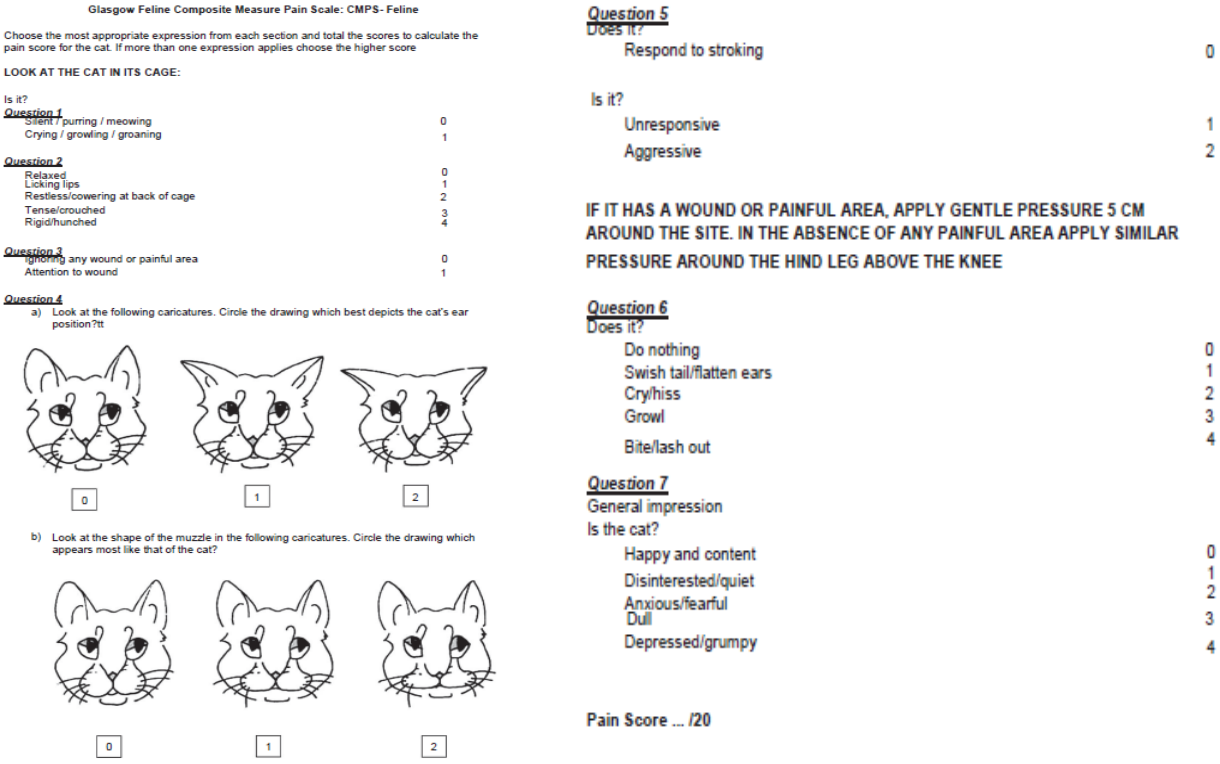
4.3.1. Glasgow Composite Measure Pain Scale – Feline (CMPS-F):

Motas-Rojas *et al.* (2021) collected the cartoon images of feline facial changes from Holden *et al.* (2014) to make this scale. So, this scale considers specific regions, or the distance required to assess an important point to evaluate facial expressions and correlate them to the degree of perceived pain, in addition, including behavioral modifications to evaluate postsurgical pain. It is a validated scale from 0 to 20 points, where 5 is the critical point where the veterinary must manage pain with drugs (figure 8).

It was developed by the University of Glasgow, hand in hand with a study that selected a total of 119 cats undergoing any acutely painful situation. Using this scale, 82.4% of the cats were correctly classified. Furthermore, from the results, 43 out 49 of the no analgesia cats and 55 out 70 of analgesia cats were correctly identified, 88 and 78.6% respectively (Reid *et al.,* 2017). Another research proved with this scale that 78.6% of cats that requires analgesia show specific facial movements (Mota-Rojas *et al.,* 2021). The scale is the next one:

Figure 8

Glasgow Composite Measure Pain Scale-Feline



Glasgow Feline Composite Measure Pain Scale: CMPS- Feline

Choose the most appropriate expression from each section and total the scores to calculate the pain score for the cat. If more than one expression applies choose the higher score

LOOK AT THE CAT IN ITS CAGE:

Is it?

Question 1

Silent / purring / meowing 0
Crying / growling / groaning 1

Question 2

Relaxed 0
Licking lips 1
Restless/cowering at back of cage 2
Tense/crouched 3
Rigid/hunched 4

Question 3

Ignoring any wound or painful area 0
Attention to wound 1

Question 4

a) Look at the following caricatures. Circle the drawing which best depicts the cat's ear position?tt

0 1 2

b) Look at the shape of the muzzle in the following caricatures. Circle the drawing which appears most like that of the cat?

0 1 2

Question 5

Does it?
Respond to stroking 0

Is it?
Unresponsive 1
Aggressive 2

IF IT HAS A WOUND OR PAINFUL AREA, APPLY GENTLE PRESSURE 5 CM AROUND THE SITE. IN THE ABSENCE OF ANY PAINFUL AREA APPLY SIMILAR PRESSURE AROUND THE HIND LEG ABOVE THE KNEE

Question 6

Does it?
Do nothing 0
Swish tail/flatten ears 1
Cry/hiss 2
Growl 3
Bite/lash out 4

Question 7

General impression
Is the cat?
Happy and content 0
Disinterested/quiet 1
Anxious/fearful 2
Dull 3
Depressed/grumpy 4

Pain Score ... /20

Considering both studies from Reid *et al.* (2017) and Motas-Rojas *et al.* (2017), and their respective results, it can be stated that the reliability of this scale is over 75%. This number can be viewed as a high value knowing the difficulty of pain recognition in cats.

4.3.2. Feline Grimace Scale (FGS):

This scale was implemented by the University of Montreal to identify acute pain, again, using facial expressions related to ears, whiskers, and nose. This scale has a 94% efficacy differencing between pain and free-pain cats. Some percents that denote the clinical utility of facial expressions are the facts that FGS has 89% overall inter-rater reliability and 91% intra-rater reliability. It is considered as one of the best feline scales available and validated (Mota-Rojas *et al.,* 2021).

An article based on 10 cats with acute pain originated from different etiologies such as pancreatitis, foreign body obstruction of the air tract or seizures, used this

scale to assess pain in these animals. It was measured upon arrival at the hospital and half an hour after administration of analgesic drugs to evaluate changes in their facial expressions and prove if pain had decreased with the treatment. Results obtained that all cats had scores between 4 and 5 out of 10 before analgesia, and the post-analgesia measurement showed values between 0 and 3, decreasing between 3 and 4 points in the 10-point scale before analgesic management (Paredes-Catota *et al.,* 2022).

As in one of the studies before, the decrease in the scoring after analgesic treatment is an easy way to reinforce the reliability of a scale, same pattern that Paredes-Catota *et al.* (2022) followed to confirm the faithfulness of this scale.

4.3.3. Multidimensional Composite Pain Scale of the University of Botucatu (UNESP-MCPS):

This scale is the only instrument to have undergone comprehensive validity, reliability, and sensitive testing and works with excellent discriminatory ability. It is composed of three subscales: pain expression (behaviors, reaction to palpation of the flank and surgical wound, and vocalization), psychomotor change (posture, comfort, activity, and attitude), and psychological variables (appetite and blood pressure). From this, a 30-point scale was obtained, where number 7 is the critical point where the animal should receive analgesia. If blood pressure cannot be measured, the result is a 27-point scale with the critical point at 6. It is an easy-to-use scale that do not requires experience, although training is recommended (Steagall & Monteiro, 2019).

Some researchers have stablished a >96.5% of sensitivity and specificity for this tool. It was evaluated in cats before and after ovariohysterectomy with blind observers (Merola & Mills, 2016).

4.4. Complementary methodologies of pain measurement:

4.4.1. Mechanical nociceptive thresholds

Mechanical thresholds testing is used to identify the point at which an animal responds to an increasing mechanical stimulus, where the magnitude of the stimulus represents the animal's nociceptive threshold. Some researchers have made interesting findings like Tomas *et al.* (2014) that found that mechanical threshold increased after surgery compared to measurements made pre-operatively in total hip replacement as a treatment for coxofemoral osteoarthritis.

A study took this as a motivation to investigate hyperalgesia in dogs with osteoarthritis, comparing mechanical thresholds in 27 dogs with osteoarthritis in one or more hind limbs (osteoarthritis group) and 28 healthy controls dogs (control group). For the measurement of mechanical threshold, it was used a handled pressure algometer which tip was positioned in contact with the anatomical site and force was applied by pushing it against the site perpendicularly on the skin surface. Application of force stops when the dog shows behavioral changes to the stimulus. The point where the force stopped was shown on the algometer screen and recorded (Harris *et al.,* 2018).

For the measurement of severity of osteoarthritis was used an owner questionnaire adapted from the Helsinki Chronic Pain Index and a specially designed clinical checklist completed by the surgeon. This helps to compare the results obtained with the algometer in a more objective way and helped reach the following results. Results determined that dogs with osteoarthritis showed higher scores in questionnaires from owner and surgeon but lower scores in the measurement with the pressure algometer, existing a negative correlation between these two parameters. This correlation means that mechanical threshold testing was able to detect hyperalgesia at stifle joints with osteoarthritis (Harris *et al.,* 2018).

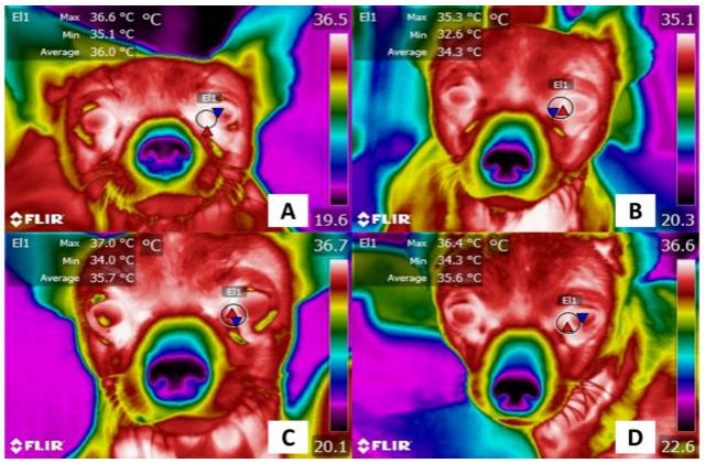
4.4.2. Infrared Thermography (IRT):

As a subject in develop, new methods and studies emerge. An interesting way of measuring pain that is still in testing phase is using infrared thermography (IRT) in assessment of pain and inflammation. Thermal imaging can be categorized as an objective method to assess acute pain, with a basis in the physiological response during pain perception. Temperature variations can be measured via IRT after a nociceptive stimulus due to the activation of the nervous system and its vasomotor consequences causing inflammation which is registered as an increase or decrease in heat radiation. Thus, measuring this heat radiation it can be assumed the level of pain that the animal is suffering. Although there is still a debate if this temperature variation response is associated with pain level and if it is reliable as a guide to adjusting analgesic treatment. The common objective is to know the type of pain and its intensity (mild, moderate, and severe) (Whittaker *et al.,* 2023).

Whittaker *et al.* (2023) demonstrated the usefulness of this tool by the following example. The temperature of the lacrimal caruncle was measured during the course of an ovariohysterectomy. As the temperature of the lacrimal caruncle increased, a rescue drug was able to restore its basal temperature (figure 9).

Figure 9

Example of thermal change that could be directly related to pain.



Note. A) maximum temperature on the facial lacrimal caruncle was 36.6ºC (▲), while the minimum was 35.1ºC (▼) before surgery. B) 1 hour after surgery, a decrease in the temperature is recorded: ▲ 35.3ºC and ▼ 32.6ºC. This could be due to a sympathetic response to the effect of pain, despite the use of analgesics. C) 2 hours after surgery and with tramadol administered as rescue analgesia, ▲ is 37.0ºC and ▼ 34.0, above the basal values, because of the drug that reduces sympathetic tone. D) 3 hours post-surgery, ▼ and ▲ are observed near the basal values, which could be associated to post-surgical stability.

As a huge advantage, this tool is 0% invasive, so it can be used in animals with complex management. As a disadvantage, the nociception process can cause vasoconstriction or vasodilation, depending on the anatomic region, which affects thermal radiation so results can vary depending on the anatomical region (Whittaker *et al.,* 2023).

Recently, IRT has been implemented in veterinary medicine. But, as said, this tool is still in its relative infancy and has yet to be fully evaluated empirically, but as seen by the moment, it is an alternative for pain assessment that has been used in other species to detect acute pain and inflammation such as osteoarthritis and that could be extrapolate to dogs and cats (Whittaker *et al.,* 2023).

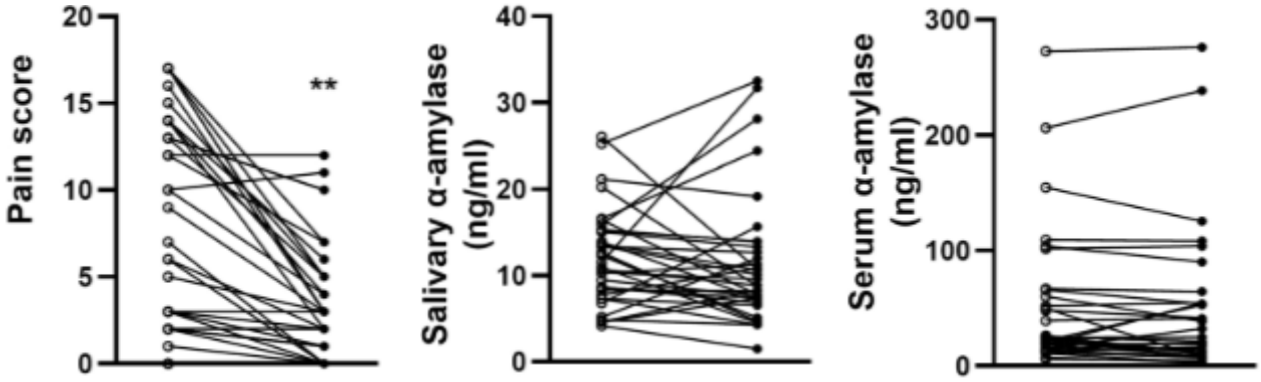
4.4.3. Salivary alpha-amylase:

Saliva is a high protein concentration fluid produced and secreted by the salivary glands which contains molecules that are present in the blood. These molecules can be measured, reflecting the physiological state of the body in a non-invasive way. Some studies found that salivary alpha-amylase was increased in diseased dogs, and it is being used in human medicine to monitor pain in patients who cannot perform self-assessments, such as domestic animals. Thirty-five dogs were involved in this study, dogs that had orthopedic or major soft tissue surgery scheduled. To reinforce the study, other indicators of pain were also measured, such as CMPS-SF, pre- and post-operative heart rate, blood pressure, and levels salivary cortisol, serum alpha-amylase and serum cortisol. (Kang *et al.,* 2022).

When referring to the results from Kang *et al.* (2022), it can be observed that, postoperatively, there was a decrease in the CMPS-SF and cortisol scores of the 31 of 35 dogs, meaning that treatment attenuated pain, but no changes in heart rate or blood pressure were found. Furthermore, statistics found a moderate positive correlation between salivary alpha-amylase levels and CMPS-SF scores, although, there was no correlation between salivary and serum alpha-amylase levels (figure 10).

Figure 10

CMPS-SF scores related to salivary and serum α-amylase between pre-operative sample (○) and post-operative sample (●).



A conclusion reached by Kang *et al.* (2022) is that the measurement of salivary alpha-amylase levels may be an effective tool for the assessment of pain-related stress un dogs.

4.4.4. Serum cytokines

Biomarkers are a focus of attention in the study of pain produced by certain pathologies, which are sensitive to the presence of diseases or their treatment. Influenced by studies in human medicine, Gruen *et al.* (2017) decided to investigate cytokines and their variation in relation to the presence and severity of osteoarthritis in cats, since they have been related to structural damage and inflammation of the joints. For this purpose, they selected serum from both healthy cats and cats with osteoarthritis and related the values obtained to a measurement of pain using a 10-point-scale based on behavior and their respective radiographies

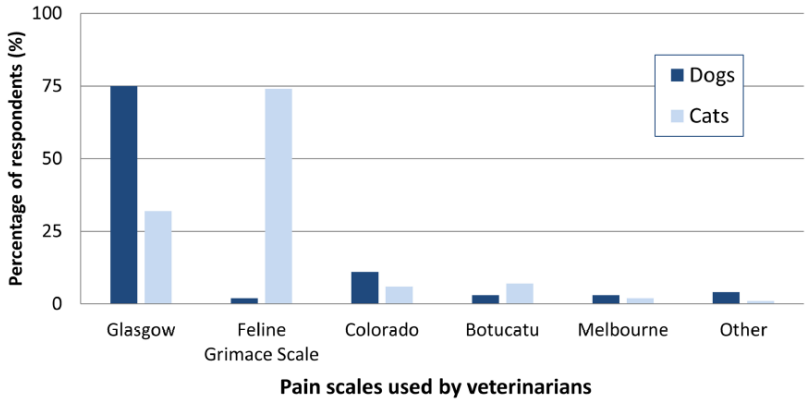
Serum from 186 cats were analyzed and found, with the results, a significant association between osteoarthritis symptoms scored from radiographs, category of pain suffering measured with pain scales and concentrations the cytokines IL-4 and IL8.In this way, it was discovered that there are differences between the serological profile of a cat with osteoarthritis and a healthy cat in terms of cytokines, making them a debatable parameter of the assessment of pain in this kind of patient by measuring increases of this biomarkers (Gruen *et al.,* 2017).

4.5. Current status of pain scales:

The most frequently employed pain assessment scale for dogs in Spain is the Glasgow Scale. In contrast, for cats, the Feline Grimace Scale was predominantly used (figure 1). Nevertheless, some geographical differences could be found, since in the United States, a non-validated pain scale (Colorado state university pain scale) came out as the most preferred tool of the surveyed population (Menendez *et al.,* 2023).

Figure 1

Pain assessment scales used by online surveyed small animal Spanish veterinarians in 2023 (responses from those who use scales are included n=80)



Note. Table extracted from "*Attitudes to acute pain and the use of pain assessment scales among Spanish small animal veterinarians*" by Menendez *et al.* (2023).

With the appearance and further development of these tools, has emerged an increase in the introduction of these scales in the daily clinical practice, attributing an importance to pain by veterinarians that is on the rise. Besides this, an important number of veterinarians haven´t bring these validated pain assessment tools to their daily practice. A recent survey interviewed a total of 292 Spanish veterinarians, where, despite an awareness of validated pain scales, only 28% of them used these tools, 72% do not use them even when 87% of them rated pain in their patients as highly relevant. Instead of the scales, they relay this parameter on clinical evaluation, although 85% admit that the introduction of these scales would improve their daily clinical performance (Menendez *et al.,* 2023).

Another study about the same topic from Bosnia and Herzegovina demonstrated that, from 73 general practice veterinarians, half of them considered the recognition and quantification of pain to be difficult, while 89% did not make use of pain assessment scales. Although, they had high levels of interest in improving their current

knowledge and skill. This means that the underuse of this scales does not only happens in Spain as stated in the study by Menendez *et al.* (2023), as Spahija *et al.* (2023) agrees with the same data but in Bosnia and Herzegovina, even in the same year. An interesting mention from this article is that majority of respondents considered their ability in pain recognition and quantification as sufficient, such as Colombian veterinarians, in contrast to the study carried out in Spain. Other studies found out that veterinarians from France, Netherlands, Switzerland, and Queensland have difficulties in pain evaluation, but it is known that pain assessment can depend on the observer's experience (Spahija *et al.,* 2023).

4.5.1. Difficulties for its implementation in daily clinical practice

From the previous point, is wanted to know why exists a huge gap between the important knowledge of pain in a pet's day-to-day wellbeing and the use of these tools. So, the limiting factors that impediment the use of pain assessment scales are lack of familiarity, time constraints and insufficient personnel. There is a secondary factor that influences negatively the use of these tools and is believed to somewhat hamper the utilization of these scales and its integration into the veterinarian routine and is the inadequacy of training. Moreover, even knowing that education is improving, is believed that the training in the use of these tools is not enough in veterinary education so it could be perceived as other big walls in this area, likely higher among older veterinarians (Menendez *et al.,* 2023).

Among other reasons, this may be due to the fact that while some may feel confident in their ability to detect, assess, and manage pain to a certain degree, evidence underscores the suboptimal nature of pain assessment. However, it is recognized by veterinarians that is necessary an additional training in pain management, which may lead to believe that there is a gap between the development and dissemination of validated pain assessment tools and their routine utilization in clinical practice (Menendez *et al.,* 2023).

4.5.2. Future implementation in daily clinical practice

Despite the minor obstacles that hinder the daily utilization of these scales, reliability is not considered a limiting factor or a concern between the main reasons, which is a good point to facilitate the introduction of these scales into their practice. Another important fact to be considered and may largely facilitate the start of utilization of these scales is the use of scales with a threshold for administering analgesics or modifying current therapy to mitigate pain. The Glasgow CMPS is an example, with a threshold of 6 out 24 maximum points guiding patient therapy, but it will be better explained later (Menendez *et al.,* 2023).

All these facts, studies and tools are aimed at the mission of veterinarians and their direct and relevant impact on the relief of the pain of the domestic animals involved directly in their wellbeing. This mission is not only based on drugs and doses to relieve the pain, but it also involves other factors that could help in their purpose including common procedures like management or handling practices, provision of a calm environment, or the presence of the owner, among others, and may greatly help to reduce stress (is related to pain) during veterinary practice (Menendez *et al.,* 2023).

Another important aspect of the veterinarian's mission to combat pain is to educate the owners of pets to keep taking care of their welfare even out of the hands of the professionals. Pet owners must have at least some knowledge about the recognition of the symptoms of pain as they will be responsible for their pet's care after discharge. Additional facts involved in this objective include scheduled follow-up appointments (most veterinarians comply with this step) and one third recommend contacting professionals if they notice any starting pain symptoms in their pets. For this step, is a must for veterinarians to give some education and transmission of knowledge and tools to recognize and even assess pain (Menendez *et al.,* 2023).

Furthermore, the training of veterinarians is necessary to ensure an improvement in the quality of life of their patients. These results suggest a window of opportunity for the implementation of training programs in small animal pain assessment at a national level (Menendez *et al.,* 2023).

4.6. Difficulties on the developing and use of pain measurement tools:

Many difficulties have arisen in the process of developing pain scales. As a first data, majority of practitioners manage pain before it appears, using anesthetic drugs preventively and inhibiting pain from arising, since inadequately pain treatment predisposes patients to medical complications as its said, increases hospital stays, extends recovery time, and increases the cost of surgical procedures. As health promoters with deontological code, it is not possible not to mitigate the pain of an animal to study it (Hansen, 2003).

As a second difficulty, in reference to the behavioral scales, some behaviors occur rarely in the day-to-day's animal so they cannot be used in measurement, while others occur frequently; some of them only happens while they are in a cage (frequency of position changes) whilst others could be seen outside a cage (dog that adopts a new posture after an anterior cruciate ligament rupture). All these changes could arise from physic pain from a disease, protection behavior, mitigate pain, to prevent initiation or exacerbation of nociception, or some may be innate expressions of pain, serving to distract, comfort, or call others to the animal's aide. This means that exists an internal and external environment that influences at the time of externalizing the pain, which makes each species manifest it in a different way, making it very difficult to develop a universal scale of pain for every specie (Hansen, 2003).

In another hand, the process to relate all these symptoms with a numerical scale is a difficult task because the perception of pain is a multidimensional system. This means that there is an influence of subjectivity in the process of associating this symptom to a number because not everyone is going to score a symptom with the same digit to a unique dog or cat. It depends on a lot of variables such as studies, impression, and personal experience, but there are many reasons for intra- and inter-observer variability in behavioral research, even when properly conducted. Said this, the subjective criterion is the most significative limitation of these techniques, suggesting that al procedures should be done by the same evaluator (Hernandez-Avalos *et al.,* 2019). However, this subjectivity disappears when moving to the use of

sensory meter and leaves behind the facial/behavioral scales as Machin *et al.* (2020) and Knazovicky *et al.* (2017) have shown in two independent studies.

Another fact is that numerical scales are usually non-linear, which means that animals with an 8 in a pain scale are suffering double of pain compared to an animal with a 4 in a scale of pain. However, these instruments are not that precise to confirm this reality, particularly when 0 in scales pain means no pain (Hansen, 2003).

Language is also a small wall when it comes to validating these scales, since a scale validated in one language does not make it valid in another language and culture. A rigorous methodology must be carried out to make sure that the main items maintain their originality and meaning to keep the essence of the scale, so the validation of this tool refers to the assessment of validity and reliability to maintain high inter- and intra-rater confidence rate. An example of this difficulty is the fact of having to develop an article to translate a scale as Brondani did when translating UNESP-Botucatu multidimensional into Spanish, Brondani *et al.* (2014), and English, Brondani *et al.* (2013).

The main problem in evaluation of cat's pain is the difficulty of interpreting and precisely assessing their subtle behavior when pain is existing because of their tent to occult signs of ill-being. Pain in dogs is way easier to assess because it´s a well-documented specie, their extrovert behavior and vocalization. Anyways, behavioral changes are not always specific for pain in domestic animals (Spahija *et al.,* 2023).

As behavioral and demeanor-based scales, the animal's way of being can influence the scoring. Likewise happened in shy or fearful cats and showing aggressiveness and scoring high values of pain, making it difficult to distinguish whether they are truly painful or whether their behavior affects pain assessment. Another confusion that can occur is between animals in pain and animals suffering from dysphoria associated with opioid use, including refusal of handling, restlessness, and agitation (Steagall & Monteiro, 2019).

In general, pain scales should be practical, user-friendly and easy to implement, independent of who is assessing the type of pain, they should discriminate between different pain intensities (mild, moderate or severe), differentiate painful from non-painful individuals and provide a cut-off point above which interventional analgesia

(rescue) is considered (or given) based on solid statistical analysis. This makes establishing a new scale a very demanding process with many parameters to consider (Steagall & Monteiro, 2019).

As for complementary tools, to validate these other non-behavioral methodologies, it would be necessary to correlate the behavioral pain scale with other methodologies such as RTI or biomarkers to enhance reliability. In this way, relating both scales could provide credibility to both parties.

These facts make this topic difficult to study in certain situations and to apply the scales.

5. CONCLUSIONS

First: Pain scales are a valuable tool for measuring pain in both cats and dogs and help to choose more assertively the drug and dose to administer to the level of pain of the animal thanks to their scoring system. This could help the confident relationship between pet owners and veterinarians.

Second: The subjectivity in pain assessment, influenced by different evaluators' opinions and species differences, means there is no gold standard scale for assessing pain, even within the same species.

Third: Pain scales are highly flexible and can be modified to suit the idiosyncrasies of each patient or the specific circumstances of each clinic. However, these modifications may affect their reliability.

Fourth: New specific scales can be developed to measure pain caused by certain diseases or their varying degrees. However, these scales must be validated by studies to confirm their reliability.

Fifth: Pain scales can demonstrate the efficacy of certain analgesic drugs, confirming whether a treatment is successful or not. This enhances knowledge about analgesia and optimizes patient well-being.

Sixth: Pain scales are a relatively new tool still in development. They will evolve as veterinarians gain more knowledge about animal behavior and physiology. Therefore, the future of pain measurement appears bright and promising.

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