



Dog ethogram: Review of existing ethograms

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ABSTRACT

The absence of a comprehensive, widely accepted ethogram for the domestic dog (*Canis familiaris*) limits the consistency and comparability of research on canine behavior. Ethograms are essential tools in behavioral science: they define the basic units of observation, reduce subjectivity through standardized terminology, and facilitate cross-study collaboration. This study reviewed ethograms developed for species in the genus *Canis*, as well as partial ethograms specifically designed for dogs, to identify strengths, limitations, and key elements for the future development of a comprehensive canine ethogram. Selection criteria for comprehensive ethograms included publication in English and coverage of the genus *Canis* species. The researchers identified four such ethograms. For partial ethograms, inclusion required descriptions of more than 10 behaviors and publication in Applied Animal Behaviour Science, Journal of Veterinary Behavior, or Animal Behaviour. From 426 initial papers, 70 partial ethograms met these criteria. Each was evaluated according to three aspects: descriptive detail, objectivity (avoidance of functional interpretations), and ease of use (presence of classifications and visual support). Clear trends emerged: comprehensive ethograms covered a wide behavioral range but often lacked descriptive precision and relied on functional labels. Partial ethograms described fewer behaviors, provided greater morphological detail, and required less interpretation, but often lacked classification systems and visual aids. A standardized ethogram should combine broad behavioral coverage, precise morphological definitions, clear classification, and visual support. Such a tool would enhance objectivity, comparability, and accessibility, establishing a robust foundation for future research and practical applications in canine behavior.

Introduction

The ethogram

The ethogram is a meticulously curated compilation of species-specific behaviors with stringent definitions (Grier, 1984). It seeks to standardize and simplify the study of species behavior, serving as the first step in adequately studying animal behavior. Describing and classifying behaviors present in ethograms are essential for quantitative ethological studies (MacNulty et al., 2007). With these descriptions, other researchers could replicate the study using the same terms and definitions, enabling comparison of results (Lehner, 1998).

To understand how an ethogram is created, behavior should be considered as a continuous line. Each individual behaves from birth until death. Researchers break this continuous line into small fragments and label each fragment with a name. This helps us to study and understand animal behavior.

Using the ethogram has several advantages. To begin with, it

facilitates the study of species behavior by providing a list of predefined behaviors. It is a means of identifying and describing the units of ethology as a science (Drummond, 1985). Moreover, it mitigates subjectivity by providing predefined, consistent criteria for each behavior and promoting reliability among observers, thereby giving researchers confidence that observed behaviours are consistent across studies (Stanton et al., 2015). Lastly, a comprehensive and standardized ethogram provides common terminology, promoting progress, collaboration, and comparison across studies of this species (Stanton et al., 2015).

There are two main types of ethograms: partial and comprehensive. An ethogram may be comprehensive, covering all the behaviors of a species, or it may focus on a particular sex, age group, or type of behavior (Lehner, 1998). Most studies on animal behavior use partial ethograms, suitable for addressing specific research questions, rather than comprehensive ethograms. These behavior lists are created by the researchers for each study (Blumstein and Daniel, 2007; Seremak et al., 2023). This practice can hinder replication of studies, as the names and

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descriptions assigned to behaviors are difficult to replicate (Viol et al., 2025). Consequently, instead of a study-by-study incremental gain in knowledge, individual studies often remain disconnected, limiting the advancement of beneficial knowledge for a species (Stanton et al., 2015).

The development of standardized, comprehensive ethograms can help minimize differences among individual descriptions, which may be disjointed and inconsistent (Viol et al., 2025). Helping to increase inter-observer reliability and giving researchers greater confidence that observed behaviors were consistent across studies.

Functionality vs. morphology

An important aspect often overlooked in creating an ethogram is the use of morphological descriptions of behavior. When a behavior is labeled, it can be done based on its structural or functional properties.

- Structural properties: a description of the set of movements performed by an individual when exhibiting a behavior.
- Functional properties: the contingency relationships between the behavior and the antecedent and subsequent stimuli.

(Froxán Parga, 2020)

In other words, the structure or morphology of a behavior refers to its form. In contrast, its functionality refers to why the behavior occurs. For example, describing the behavior of a person sitting on a chair:

- Morphological description: The person bends their knees, positioning the femur at a 90° angle to the tibia and resting their glutes on the seat of the chair.
- Functional description: The person sits to rest because they are tired after walking for half an hour.

An ethogram should label behaviors morphologically, avoiding any functional interpretation (Lehner, 1998; Rose and Riley, 2021; Spagnuolo et al., 2021). To make functional interpretations, it is necessary to validate whether that behavior indeed serves the assumed function at that particular moment. Without such validation, including functional interpretations in the ethogram inevitably leads to the researcher's personal and subjective interpretations. These interpretations could introduce bias into studies that use the ethogram as a basis for their research, potentially leading investigators to draw erroneous conclusions about the behaviors under study.

The dog ethogram

Complete and standardized ethograms have been developed for the study of the behavior of other species, such as chimpanzees (Nishida et al., 1999), mice (Mouse Behavior, n.d.), bridled white-eye (Smith and Wassmer, 2016), giraffe (Seeber et al., 2012), elephants (ElephantVoices, 2021), horses (McDonnell, 2003), psittacidae (Viol et al., 2025), and giant anteater (Schmidt, 2012). All these ethograms are comprehensive; most include visual aids, and some are published on a website where videos are uploaded to aid understanding of the definitions.

In contrast, a comprehensive and standardized ethogram for the domestic dog (*Canis familiaris*) does not currently exist. This absence is particularly striking given the extensive volume of studies addressing canine behavior. Several factors may help explain why, despite this abundance of research, an ethogram of these characteristics has not yet been developed for this species.

First, there is a relative scarcity of basic ethological research on dogs when compared with other species commonly used as models in behavioral research (Hansen Wheat and Wynne, 2025). In parallel, recent decades have seen a consolidation of applied ethology approaches, with a predominance of studies focused on clinical contexts, welfare assessment, dog cognition, training, or human–dog interactions.

This applied orientation has been accompanied by substantial methodological heterogeneity and a lack of standardization in the procedures employed (Diederich and Giffroy, 2006; Moser et al., 2024).

Consequently, most studies on canine behavior rely on partial ethograms developed specifically for individual investigations, tailored to specific objectives and difficult to compare across studies. This pattern, as reflected in the results of the present study, limits the consolidation of a shared descriptive language and contributes to the persistence of the identified methodological gap.

Although this review identifies a comprehensive ethogram specifically developed for dogs (Banerjee and Bhadra, 2022), it is presented solely as an appendix to a separate behavioral study. It has not been used as a standard reference in subsequent research on canine behavior. The absence of a widely accepted, comprehensive dog ethogram, therefore, continues to hinder the standardization of behavioral nomenclature and the comparability of findings across studies.

To address this limitation, this study aims to analyze ethograms of the genus *Canis* species and partial ethograms developed for dogs. This approach is grounded in comparative ethology, which has long justified the use of phylogenetically related species to inform behavioral descriptions (Tinbergen, 1963; Hinde, 1970), and has been widely applied in canids, where shared morphological and behavioral patterns have been described across species (Fox, 1970; Bekoff, 1974; Boitani and Ciucci, 1995; Range and Virányi, 2013; Heberlein et al., 2016; Amici et al., 2024).

By integrating ethograms from multiple *Canis* species, this analysis seeks to gather as much descriptive information as possible on existing behavioral classifications, identify recurrent patterns and gaps across different ethograms, and evaluate how behaviors have been operationalized within the genus. Ultimately, this comparative approach provides a structured foundation for developing a standardized, comprehensive ethogram for the domestic dog, grounded in morphological descriptions and compatible with established ethological frameworks.

Methods and materials

A compilation of studies that incorporated ethograms of domestic dogs and other species in the genus *Canis* (*Canis latrans*, *Canis hallstromi*, and *Canis lupus*) was conducted.

To identify the ethograms, a systematic search was performed as follows:

1. Development of a list of keywords: ethogram, canid, wolf, coyote, dog, canine, *canis*
2. Construction of an advanced search:
 - a. ethogram AND (“canid” OR “wolf” OR “coyote” OR “dog” OR “canis” OR “canine”) AND (“complete” OR “comprehensive”)
 - b. ethogram AND (“canine” OR “dog” OR “*canis familiaris*”)
 - c. Selection of databases: ScienceDirect, Web of Science, Scopus, PubMed. Google Scholar was also consulted for additional sources not indexed in the aforementioned databases.

Once all relevant articles were retrieved, they were classified into two categories: comprehensive ethograms for canids and partial ethograms for domestic dogs. To select the ethograms for analysis, inclusion and exclusion criteria were established.

For the complete canid ethograms:

- Inclusion criteria: All complete ethograms published for species within the genus *Canis* and written in English.
- Exclusion criteria: Ethograms that include only behaviors relevant to a specific research question; ethograms that are complete but refer to species outside the genus *Canis*.

For the partial ethograms:

- Inclusion criteria: Ethograms describing more than ten¹ distinct behaviors; published in English; included in articles from Applied Animal Behavior Science, Journal of Veterinary Behavior, and Animal Behavior.
- Exclusion criteria: Partial ethograms not focused on domestic dogs (*Canis familiaris*).

Once the articles were selected, the analysis was initiated. Complete ethograms were analyzed first (Table A.1), followed by partial ethograms (Table A.2). Each ethogram was evaluated based on three parameters: level of detail, objectivity, and ease of use.

A rank is created for every parameter:

Level of detail

A structured and comparable ethogram should explicitly describe which body parts are involved in each behavior, catalogue their possible states, and define behavioral units based on the actual form and position of those body parts. This morphological approach ensures clarity and comparability across studies and avoids ambiguous or circular definitions (Fugazza and Miklósi, 2014). In line with this, the criterion Level of Detail in this study was operationalized as follows:

Highly detailed (3)

The behavior is described with multiple sentences, detailing specific parts of the body involved in each behavior. There are no ambiguities in the descriptions, and the behavior is clearly defined, making it easy for the observer to interpret. The name of the behavior is not used in the description itself, ensuring clarity and specificity.

Moderately detailed (2)

The description uses one or two sentences and may describe some body parts involved in the behavior. While the descriptions are generally clear, some details might be missing or vague, leaving room for interpretation by the observer. The behavior's name may be used in the description, which can introduce ambiguity.

Lacking detail (1)

The description is very brief, often consisting of a single sentence or even just one word. There is little to no mention of the body parts involved, and the descriptions are often ambiguous, making it difficult for the observer to accurately interpret the behavior. Using the same name for the behavior in the description makes it difficult to define the behavior clearly.

Objectivity

Formal descriptions of behaviors in an ethogram should be empirical, objectively documenting the form and temporal pattern of the movements and postures observed in the focal animal. Such empirical descriptions avoid implying intent or function, ensuring that even a reader unfamiliar with animal behavior can reliably identify the described behavior. In contrast, functional descriptions introduce

subjective assumptions about the animal's intent, purpose, or emotional state, which can compromise clarity and reproducibility (Lehner, 1998). In line with these principles, the criterion Objectivity in this study was operationalized as follows:

Highly objective (3)

The description is based solely on the morphology of the behavior, with no functional or emotional interpretations. Behaviors are classified without any subjective assumptions about their purpose or intention. If the behaviors are classified, the classification is morphological.

Moderately objective (2)

While the description is mostly objective, there may be occasional references to the functionality or intention of the behavior (e.g., "attempts to assert dominance" or "shows fear"). However, these interpretations are minimal and do not dominate the description. It can include some functional classification.

Lacking objectivity (1)

The description includes functional or emotional interpretations (e.g., "wants attention" or "acts nervously"), which are not directly supported by observable behavior. These interpretations may affect the clarity of the description of the behavior.

Ease of use

If an ethogram is user-friendly, it becomes more useful in the field (Way et al., 2006). The inclusion of visual aids (such as drawings or photographs) alongside written descriptions has been suggested to enhance usability and observer accuracy in ethograms (e.g., Martin and Bateson, 2007). A complete ethogram also includes behavioural categories, as behaviours are grouped into sets believed to serve a common purpose (Broseghini et al., 2024). These two aspects are considered to enhance the ease of use of ethograms, and therefore, the following operationalisation was defined:

Highly user-friendly (3)

The ethogram includes clear and helpful visual supports (e.g., images, diagrams) that aid the interpretation of behaviors. The behaviors are well organized and logically classified, making it easy to locate any behavior. The format is visually appealing, with a clean, easy-to-read layout and a design that enhances comprehension.

Moderately user-friendly (2)

The ethogram does not include visual support, or it includes only a few. However, the behaviors are well organized and logically classified, making them easy to locate. The format is clean, readable, and visually pleasant, making it easy to follow despite the lack of images or diagrams.

Somewhat difficult to use (1)

The behaviors are not clearly classified, making it difficult to identify specific behaviors. The layout is somewhat cluttered, but it remains readable. There is no visual support or categorization, which makes it harder to navigate through the document.

Ethogram-level scores were then assigned using the following decision rules. For objectivity and detail:

Score 3: assigned when 100% of behavioral units were coded as high (3).

Score 2: assigned when >50% of behavioral units were coded as high (3).

Score 1: assigned when ≤50% of behavioral units were coded as high (3).

To address cases in which no units were coded as high (3), additional tie-breaking rules were applied to ensure reproducibility:

When 0% of units were coded as high (3), the ethogram-level score was based on the relative proportion of moderate (2) versus low (1)

¹ A minimum of ten distinct behaviors was required for partial ethograms to ensure sufficient behavioral richness for meaningful analysis. This threshold was established to exclude overly limited behavioral lists and to facilitate comparison across studies, serving as a pragmatic methodological criterion to ensure a minimum level of behavioral diversity and structural complexity.

units:

Score 2 was assigned when >50% of units were coded as moderate (2).

Score 1 was assigned when ≥50% of units were coded as low (1).

When distributions were exactly balanced (e.g., 50% moderate (2) and 50% low (1)), the ethogram was conservatively categorized as Score 1. This conservative rule was adopted to avoid overestimating ethogram quality in borderline cases.

For ease of use, three features were assessed at the ethogram level: presence of visual aids (e.g., photographs or drawings), classification of behaviors into categories, and overall visual clarity/readability. A score of 3 was assigned when all three features were present; a score of 2 when at least one feature was present; and a score of 1 when none were present.

A single observer conducted the analysis. When classification uncertainty arose, the observer consulted professionals from the Department of Ethology at the Universitat Autònoma de Barcelona (UAB) to resolve definitional ambiguities and ensure consistent application of the scoring rules.

Results

The systematic search identified four comprehensive ethograms and 426 papers containing partial ethograms. Of these, 70 met the established inclusion criteria.

After analyzing the selected studies, the findings were organized into two summary tables in Appendix A (Table A.1 and Table A.2). Table A.1 presents the results for the comprehensive ethograms. In contrast, Table A.2 summarizes the characteristics of the partial ethograms that met the inclusion criteria.

Comprehensive genus *Canis* ethograms

Four comprehensive ethograms published for canid species were analysed: dog (*Canis familiaris*), coyote (*Canis latrans*), wolf (*Canis lupus*), and New Guinea singing dog (*Canis hallstromi*). The number of recorded behaviors was very high across all cases, ranging from 140 in the wolf ethogram to 540 in the coyote ethogram. All ethograms included a classification of behaviors; however, only the coyote, wolf, and New Guinea singing dog ethograms incorporated illustrations to facilitate interpretation, whereas the dog ethogram did not. However, the scores for level of detail (see Fig. 1) and objectivity (see Fig. 2) were relatively low, owing to a general tendency to describe behaviors from functional or subjective perspectives rather than morphological ones. In contrast, ease of use was high (see Fig. 3) for the wolf and singing dog ethograms, thanks to their clear organization and visual support. The distribution of scores across parameters is summarized in Table 1.

Level of Detail for Comprehensive Ethograms

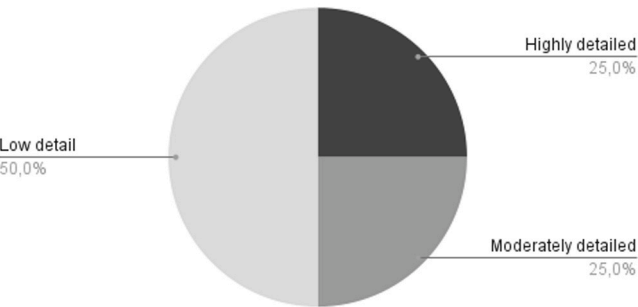


Fig. 1. Distribution of level-of-detail scores for comprehensive canid ethograms. Half of the ethograms were classified as low detail (50.0%), while the remaining were evenly distributed between moderate (25.0%) and high detail (25.0%).

Objectivity for Comprehensive Ethograms

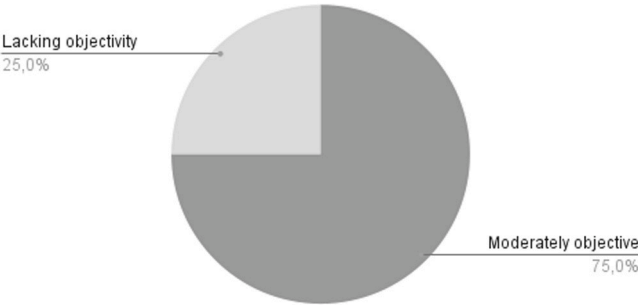


Fig. 2. Distribution of objectivity scores for comprehensive canid ethograms. The majority of ethograms were rated as moderately objective (75.0%), while a smaller proportion lacked objectivity (25.0%).

Ease of Use for Comprehensive Ethograms



Fig. 3. Distribution of ease-of-use scores for comprehensive canid ethograms. Half of the ethograms were rated as highly user-friendly (50.0%), while the remaining half were classified as moderately user-friendly (50.0%).

Table 1
Summary of the analysis of comprehensive genus *Canis* ethograms.

Criterion	Level of Detail	Objectivity	Ease of use
High (3)	25 %	0 %	50 %
Moderate (2)	25 %	75 %	50 %
Low (1)	50 %	25 %	0 %

Partial dog (*Canis familiaris*) ethograms

Partial ethograms specifically published for domestic dogs (*Canis familiaris*) between 2004 and 2025 were analysed. The number of behaviors included in these ethograms varied considerably, ranging from 10 (the minimum required by the inclusion criteria) to 44 (Schilder and van der Borg, 2004), with a median of 20.07 behaviors. Most ethograms (64.3 %) included a classification of behaviors, while the remaining 35.7 % only listed them. Illustrations were exceptionally rare, with only the study by Pekkin et al. (2016) providing them.

The level of detail was moderate in more than half of the partial ethograms (51.5%), 11.4% of the ethograms were classified as highly detailed, and the remaining 1.4 % as poorly detailed (see Fig. 4).

Objectivity was notably high across most studies, with 81.4% achieving the maximum score, reflecting a consistent morphological approach to defining behavior (see Fig. 5).

Partial ethograms were generally less user-friendly, with 67.1% rated as moderately user-friendly and 32.9% rated as having low user-friendliness (see Fig. 6). Overall, dog ethograms tend to be objective and precise, but less accessible and less visually supported. The overall distribution of scores highlights structural variability across parameters (Table 2).

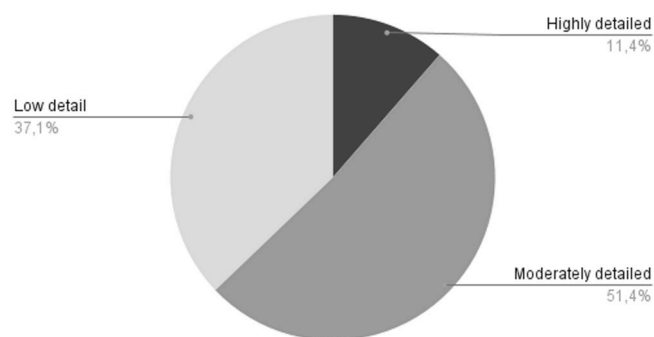


Fig. 4. Distribution of level-of-detail scores for partial dog ethograms. The majority of ethograms were classified as moderately detailed (51.4%), followed by low detail (37.1%) and highly detailed (11.4%).

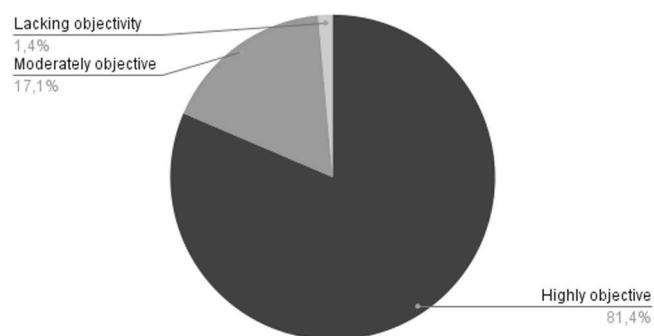


Fig. 5. Distribution of objectivity scores for partial dog ethograms. Most ethograms were rated as highly objective (81.4%), with fewer classified as moderately objective (17.1%) or lacking objectivity (1.4%).

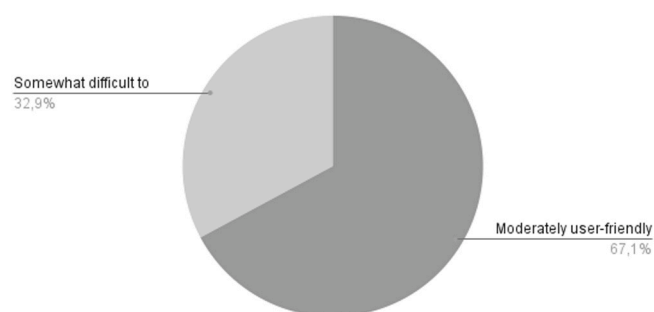


Fig. 6. Distribution of ease-of-use scores for partial dog ethograms. Most ethograms were rated as moderately user-friendly (67.1%), while a smaller proportion were considered somewhat difficult to use (32.9%).

Comparative analysis

To provide a quantitative overview, mean scores were calculated for the criteria of Level of Detail, Objectivity, and Ease of Use (Table 3). These mean values were derived from the descriptive data presented in Table A.1 in Appendix A, which summarizes the evaluation of each comprehensive and partial ethogram included in the analysis.

In summary, the review shows that comprehensive canid ethograms tend to prioritize ease of use through illustrations and clear organization, at the expense of morphological detail and objectivity. In contrast, partial dog ethograms are distinguished by their objectivity and descriptive precision, though there remains room for improvement in usability and visual support.

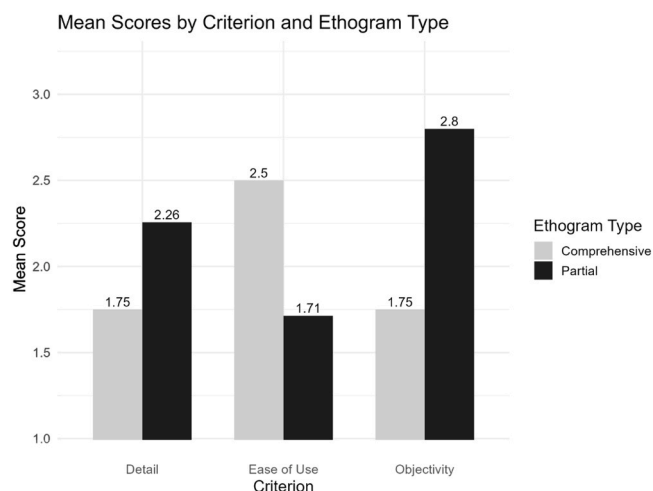


Fig. 7. Mean scores by criterion and ethogram type. Partial dog ethograms showed higher mean scores for detail (2.26) and objectivity (2.80), whereas comprehensive canid ethograms scored higher in ease of use (2.50 vs. 1.71).

Table 2

Summary of the analysis of partial dog (*Canis familiaris*) ethograms.

Criterion	Level of Detail	Objectivity	Ease of use
High (3)	11.4 %	81.4 %	0 %
Moderate (2)	51.4 %	17.1 %	67.1 %
Low (1)	37.1 %	1.4 %	32.9 %

Table 3

Average scores for comprehensive and partial ethograms across evaluation criteria.

Criterion	Comprehensive ethograms (mean)	Partial ethograms (mean)
Level of detail (1–3)	1.75	2.26
Objectivity (1–3)	1.75	2.80
Ease of use (1–3)	2.50	1.70

Discussion

As has been emphasized throughout this article, the ethogram is a fundamental tool in animal behavior research. The goal of the ethogram is to standardize data collection across sampling periods, observers, animal populations, and different studies. In this way, results are directly comparable and can collectively contribute to our understanding of animal behavior (Rose and Riley, 2021).

In the case of dogs, the absence of a comprehensive and standardized ethogram creates several disadvantages. There is no consensus on terminology for labeling dog behavior, as different papers often use different terms to describe the same behavior. This inconsistency makes studies difficult to replicate and can lead to confusion when drawing conclusions (Viol et al., 2025). Developing a partial ethogram for each study is also time-consuming and may reduce both consistency and reliability in the study of dog behavior. A comprehensive, standardized ethogram for dogs could enhance research quality while reducing the time required to study canine behavior.

Insights can be drawn from ethograms available for other species. For example, the chimpanzee ethogram (Nishida et al., 1999) documents a large number of behaviors, representing an update of a previous ethogram (Goodall, 1989). Nevertheless, this ethogram lacks images that would facilitate interpretation and includes numerous functional interpretations of behaviors. By contrast, the giraffe (Seeber et al., 2012)

and the Bridled White-eye ethograms (Smith and Wassmer, 2016) include slightly fewer behaviors but provide more detailed definitions, fewer functional interpretations, and images that clarify the descriptions. Similarly, the ethograms of the elephant (ElephantVoices, 2021) and the mouse (Mouse Behavior, n.d.) offer the great advantage of being published as websites. This makes them far more accessible and dynamic, and also allows the inclusion of videos, which further enhance the understanding of the behaviors.

Among the most detailed, objective, and easy-to-use ethograms are those of the horse (McDonnell, 2003) and the giant anteater (Schmidt, 2012). These ethograms are almost entirely devoid of functional interpretations in their definitions, which are reserved for classifying and naming behaviors. In addition, the definitions are detailed and clear, accompanied by photographs and illustrations. In McDonnell's case, the ethogram is published in book format, making it very easy to read and use, although publishing it on a website would give it even greater reach.

Compared with these examples, ethograms currently available for dogs and other genus *Canis* species reveal general limitations that must be addressed to produce a widely applicable tool. Firstly, many include functional or subjective interpretations of behavior, which is problematic because it can lead to misinterpretations and, in turn, to false conclusions (Lehner, 1998; Rose and Riley, 2021; Spagnuolo et al., 2021). Secondly, the interpretation of behaviors is further hindered by insufficient definitional detail. More precise descriptions, including explicit references to multiple body regions, would enhance observational accuracy and improve behavioral discrimination (Fugazza and Miklósi, 2014). This approach has not been adopted in any other comprehensive ethogram. Finally, ease of use is another concern that is often overlooked in the design of ethograms. Considering this factor could encourage the broader adoption of standardized and comprehensive ethograms (Way et al., 2006).

An important exception within canine behavioral description is the development of the Dog Facial Action Coding System (DogFACS), a standardized, anatomically based system for coding facial movements (Waller et al., 2013). DogFACS applies a morphologically grounded framework derived from facial musculature and provides clearly defined action units, with established reliability demonstrated through testing. Although DogFACS is limited to facial expressions and does not constitute a comprehensive behavioral ethogram, it demonstrates that objective, anatomically detailed, and reliability-tested coding systems are feasible in dogs. The methodological rigor of DogFACS highlights the potential benefits of extending similar principles of morphological precision and validation to a full canine ethogram.

When comparing ethogram types, partial ethograms for dogs and comprehensive ethograms for the genus *Canis* species, the following patterns were observed: comprehensive ethograms include a large number of behaviors but often provide minimal descriptive detail and frequently rely on functional labels. They typically offer behavior classification and occasionally include illustrations. In contrast, partial ethograms usually describe fewer behaviors, but these are defined in more morphological and detailed terms. However, they often lack classification and visual support, which limits their practical utility.

Based on these findings, this study recommends focusing on the strengths of both comprehensive and partial ethograms to develop a tool that can be widely applied, as in the case in other species. The resulting ethogram should include the maximum range of dog behaviors; describe them in morphological detail and by describing the position of each body part to reduce the risk of misinterpretation; organize them into clear categories, and incorporate visual references. Functional labels and definitions should be avoided to ensure objectivity.

To operationalize these recommendations, it is necessary to clarify the methodological strategies available for ethogram construction. Different approaches may be adopted depending on the objectives and scope of the study. First, the source of information may vary. An ethogram can be developed either from existing literature or from direct

behavioral sampling (Spagnuolo et al., 2021), although combining both sources is preferable. A literature review can be conducted to generate a preliminary list of behaviors, which is subsequently refined and validated through empirical observation.

Concerning observational procedures, the sampling method will depend on the objective of the ethogram. If the aim is to develop an exhaustive ethogram that includes the maximum number of behavioral units, all-occurrence sampling is recommended. Conversely, if the objective is to analyze behavioral duration or temporal distribution in greater detail, scan sampling is more appropriate (Altmann, 1974).

If both sources of information (bibliographic revision and behavioral sampling) are combined, once a preliminary list of behaviors has been established, one or more groups of individuals should be selected for observation. When selecting the sample, data collection accessibility should be considered, whether observations are conducted via video recordings or direct observation (Spagnuolo et al., 2021). During sampling, behaviors should be recorded in as much morphological detail as possible to enable an accurate operational definition at a later stage. Behavioral definitions should be clear, concise, and comprehensive to ensure consistency and replicability (Lehner, 1998).

In defining behavioral units, it is advisable to follow the approach proposed by Schleidt et al. (1984), which emphasizes the description of the posture and configuration of individual body parts. This level of structural specification facilitates future interpretation and improves inter-observer reliability by reducing ambiguity in behavioral categorization.

Finally, to enhance the methodological robustness of an ethogram, a formal reliability assessment is recommended. Ethogram validation may include inter-observer reliability when multiple observers are involved and intra-observer reliability when the same observer codes repeatedly. Inter-observer reliability evaluates the consistency with which different coders apply behavioral categories, whereas intra-observer reliability assesses the stability of coding over time. The inclusion of one or both approaches depends on the study design and intended application of the ethogram. Recent ethogram development studies have begun to incorporate both inter- and intra-observer validation procedures (Pallante et al., 2023; Lewis et al., 2025).

The choice of agreement statistic should be aligned with the type of data collected. For categorical behavioral data coded by two observers, Cohen's kappa provides an estimate of agreement corrected for chance. When behavioral measures are continuous (e.g., duration, frequency, or proportion of time), intraclass correlation coefficients (ICC) offer an appropriate estimate of agreement across observers or repeated measures. In cases involving multiple observers coding categorical data, Krippendorff's alpha represents a flexible alternative, as it can be applied across nominal, ordinal, interval, and ratio levels of measurement and accommodates missing observations (Hallgren, 2012).

The systematic incorporation of reliability statistics strengthens the internal consistency and methodological rigor of an ethogram and should be considered an important component of its development.

To further enhance the usability and accessibility of such an ethogram, this study also proposes the development of a dedicated website to host it. An online platform would allow for continuous updates as new observations and research emerge, ensuring the ethogram remains current and comprehensive. Additionally, the website could include illustrative videos of each behavior, providing observers with dynamic visual examples that improve identification accuracy and inter-observer reliability. This proposal is inspired by similar initiatives in other species, such as elephants, mice, and wolves, for which ethograms are already available online and maintained as living, evolving resources for researchers and practitioners.

Implementing such an ethogram could provide a standardized foundation for future research and applied work in canine behavior, facilitating clearer communication and stronger cross-study comparisons.

A limitation of this study is that a single reviewer performed the

ethogram evaluation, and formal inter-observer reliability was not assessed. Although clear criteria were applied consistently across studies, future work would benefit from involving multiple independent raters and quantifying agreement using standard reliability metrics. This would further strengthen the objectivity and reproducibility of ethogram evaluations.

Conclusion

Creating a comprehensive and standardized ethogram is essential for unifying criteria, ensuring consistent terminology, and minimizing researcher subjectivity. Compared with other species, the study of dog behavior is hindered by the absence of an ethogram.

This study suggests combining the most salient aspects of each type of ethogram (comprehensive and partial) in canids to create a widely applicable framework. The fundamental principles that this ethogram should consider are the following: to gather the highest possible number of dog behaviors, describing them in as much detail as possible to avoid misinterpretations; to classify the behaviors and accompany them with illustrations to facilitate their use; and to avoid functional classifications and definitions to enhance the objectivity of the ethogram.

CRedit authorship contribution statement

Xavier Manteca Vilanova: Writing – review & editing, Validation, Supervision, Resources. **Laura Saiz i Vivas:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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Ethical statement

This article is a review of previously published literature and does not contain any studies with animals or human participants performed by any of the authors.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work, generative AI and AI-assisted technologies (ChatGPT 5 and Grammarly) were used to improve the clarity, grammar, and structure of the manuscript. After using these tools, the authors reviewed and edited the content as needed and took full responsibility for the final version of the manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A

Table A1
Comprehensive ethograms for species within the genus *Canis*. Ethograms are listed in alphabetical order by first author

No.	Species	Reference / Author	No. of Behaviors	Classification (Yes/No)	Illustrations (Yes/No)	Level of Detail (1–3)	Objectivity (1–3)	Usability (1–3)	Observations
1	Dog (<i>Canis familiaris</i>)	Banerjee and Bhadra (2022)	178	Yes	No	1	2	2	Behaviors are not well detailed; subjective functionalities; lacks visual support
3	Wolf (<i>Canis lupus</i>)	International Wolf Center	140	Yes	Yes	2	2	3	Many functional interpretations; very visual and easy to use.
4	New Guinea Singing Dog (<i>Canis hallstromi</i>)	Koler-Matznick et al. (2005)	200+	Yes	Yes	3	1	3	Many functional interpretations; functional classification; very well organised and includes lots of images
2	Coyote (<i>Canis latrans</i>)	Way and Strauss (2006)	200+	Yes	Yes	1	2	2	Clear but not detailed descriptions; photos help; structure makes it hard to use

Table A2Partial ethograms for domestic dogs (*Canis familiaris*), 2004–2025. Ethograms are listed in alphabetical order by first author

No.	Reference / Author	No. of Behaviors	Classification (Yes/No)	Illustrations (Yes/No)	Level of Detail (1–3)	Objectivity (1–3)	Usability (1–3)	Observations
13	Arhant et al. (2020)	18	No	No	2	3	2	Is visually difficult to identify the classification; some definitions use the name of the behavior The mixture of behaviors and postural modifiers under single entries (like "looking at") slightly reduces clarity and usability. Highly detailed ethogram with clear differentiation of complex social behaviors; lack of visual aids slightly limits usability
70	Barnard, et al. (2012)	27	No	No	2	2	2	
22	Bauer and Smuts (2007)	14	Yes	No	3	3	2	
62	Brayley and Montrose, (2015)	14	No	No	2	3	1	
35	Broseghini, et al. (2024)	+20	Yes	No	3	3	2	Extremely detailed ethogram with multi-level descriptions of posture, sensory orientation, and movement during predatory phases. Despite its depth, the lack of visual aids slightly reduces ease of use Lacks behavioral categorization, which may hinder ease of use despite strong detail and objectivity The ethogram includes functional classification for stress-related behaviors, but definitions remain objective and based on observable morphology. A few functional interpretations appear in the classification labels (e.g., stress-related behaviors, fearful behaviors), but despite this, the ethogram is considered highly objective due to its clear and detailed morphological definitions.
52	Bryant, et al. (2018)	31	No	No	3	3	1	
34	Byrne and Arnott (2024)	23	Yes	No	1	3	2	
17	Cimarelli et al., (2024)	14	Yes	No	3	3	2	
28	Diverio et al., (2017)	10	Yes	No	1	3	2	Very detailed; morphologically classified; user-friendly but no images A functional classification (e.g., dominance, aggression, fear) is used, but the detailed behavioral descriptions remain objective and observable.
4	Epstein et al., (2021)	31	Yes	No	3	3	2	
44	Feuerstein and Terkel (2008)	36	Yes	No	3	2	2	
42	Flint et al. (2018)	37	Yes	No	3	3	2	
14	Foyer et al. (2016)	11	Yes	No	2	3	2	There is a functional category but the definitions are extremely objective Clear behavioral categories, but descriptions are minimal and lack morphological detail Despite some definitions being brief, this ethogram is highly usable with clear scoring instructions and maintains objectivity through morphological descriptions Includes emotional state classification, which introduces subjectivity despite clear, observable behavior descriptions.
55	Grainger, et al. (2016)	13	No	No	2	2	1	
54	Harvey et al. (2016)	29	No	No	3	3	2	
43	Hauser et al. (2020)	43	Yes	No	3	3	2	
9	Haverbeke et al. (2009)	14	Yes	No	3	3	2	Short and vague definitions; lacks morphological detail but remains objective.
8	Haverbeke et al. (2010)	14	Yes	No	3	3	2	
27	Jean-Joseph, et al. (2022)	20	Yes	No	1	3	2	
36	Kohoutková et al. (2024)	18	Yes	No	2	3	3	
24	Kiddie and Collins (2014)	43	Yes	No	2	2	2	Very brief definitions Some descriptions are moderately detailed, but a few rely on functional labels or are difficult to distinguish morphologically (e.g. self-handicapping, offensive).
57	Kinnaird and Wells (2022)	14	Yes	No	2	3	2	
53	Kockaya et al. (2018)	13	No	No	1	3	1	
25	Lee et al. (2022)	28	No	No	1	3	1	
69	Lensen, et al. (2017)	18	Yes	No	2	3	2	Lacks morphological detail in social interactions While the behavioural descriptions are highly detailed and precise, the classification
1	Levine et al., (2007)	12	No	No	1	3	1	
66	Lopes, et al. (2022)	27	No	No	2	1	2	
64	Maglieri, et al. (2022)	28	Yes	No	2	2	2	
6	Mariti et al. (2017)	17	No	No	2	3	1	
15	Martinez et al. (2021)	13	Yes	No	2	3	1	
47	McCullough et al. (2018)	30	Yes	No	3	2	2	

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Table A2 (continued)

No.	Reference / Author	No. of Behaviors	Classification (Yes/No)	Illustrations (Yes/No)	Level of Detail (1–3)	Objectivity (1–3)	Usability (1–3)	Observations
21	McGarrity et al. (2016)	23	Yes	No	3	3	2	is functional (e.g., affiliative, stress indicators), which introduces interpretation of the dog's internal state. Despite this, the ethogram remains largely objective and easy to follow. Highly detailed and objective ethogram with precise measurement criteria, though the complexity and lack of visual aids may challenge quick usability
20	McGowan et al. (2018)	10	No	No	3	3	1	
45	Menchetti et al. (2019)	20	Yes	No	1	3	3	
50	Menuge et al. (2021)	14	Yes	No	2	3	2	
2	Mills et al., (2006)	10	Yes	No	2	2	2	
65	Murtagh, et al. (2020)	14	Yes	No	2	2	2	Some behaviors, such as "explore" or "rest", are explicitly assigned affective labels (e.g., "positive") and include functional references, which should be avoided in a purely morphological ethogram.
59	Ng et al. (2014)	27	Yes	No	3	3	2	
5	Normando, et al. (2019)	27	Yes	No	3	2	2	
51	O'Riordan and Roth, (2023)	13	Yes	No	2	3	2	
49	Parthasarathy and Crowell-Davis (2006)	18	Yes	No	2	3	2	
29	Payne, et al. (2017)	10	No	No	2	3	1	Includes a helpful visual aid for tail positions, which supports interpretation and enhances ease of use.
56	Pekkin et al. (2016)	16	Yes	Yes	2	3	3	
32	Pfaller-Sadovsky, et al. (2023)	10	No	No	2	3	1	
37	Phillips Buttner and Strasser (2022)	15	No	No	3	3	1	
3	Protopopova and Wynne, (2014)	30	No	No	2	3	1	
61	Rehn and Keeling (2011)	25	No	No	2	2	1	Includes many fine postural variables, especially for ears and tail—useful for detailed body language analysis
41	Rehn et al., (2014)	13	No	No	2	3	1	
7	Roth and Jensen (2015)	20	Yes	No	2	3	2	
19	Sarrafcchi et al. (2025)	14	Yes	No	2	3	2	
31	Sarrafcchi, et al. (2022)	15	Yes	No	2	3	2	
16	Scandurra, et al. (2016)	15	No	No	3	3	1	Is visually difficult to relate the behavior with the descriptions
67	Schilder and van der Borg (2004)	44	Yes	No	3	3	2	
60	Schipper et al. (2008)	30	Yes	No	2	2	2	
30	Shaw and Riley (2020)	12	No	No	2	3	1	
38	Shaw and Riley, (2024)	12	No	No	3	3	1	
12	Shaw, et al. (2022)	21	No	No	3	3	1	Visually appealing but no images, order or classification Very clearly classified; lacks visual support It could benefit from greater morphological detail. The ethogram includes basic grouping of behaviors, but most lack descriptive content beyond naming, which limits clarity and observer consistency.
18	Skånberg et al. (2018)	11	Yes	No	3	3	2	
11	Stahl et al. (2024)	12	No	No	3	3	1	
10	Stellato et al. (2017)	16	Yes	No	3	3	2	
68	Sundman, et al. (2018)	13	Yes	No	2	3	2	
23	Titulaer et al. (2013)	27	Yes	No	1	3	2	Sub-behaviors listed under Anticipation pre-consumption (e.g., wagging tail, licking lips, pushing face through bars, jumping) are
33	Tod, et al. (2005)	21	Yes	No	2	3	2	
39	Travain, et al. (2015)	10	No	No	2	3	1	
63	Velebit, et al. (2024)	10	Yes	No	2	3	2	

(continued on next page)

Table A2 (continued)

No.	Reference / Author	No. of Behaviors	Classification (Yes/No)	Illustrations (Yes/No)	Level of Detail (1–3)	Objectivity (1–3)	Usability (1–3)	Observations
								considered distinct behaviors and are included in the total behavior count.
48	Walker et al. (2016)	29	Yes	No	2	3	1	
58	Walker, et al. (2014)	37	Yes	No	3	3	2	
40	Walsh et al., (2023)	33	No	No	3	3	1	
46	Ward, et al. (2008)	10	Yes	No	2	2	2	Although the classification is based on presumed function (e.g., offense, self-handicapping), the behavioural descriptions are largely morphological and clearly defined
26	Wilson et al., (2020)	18	Yes	No	2	3	2	

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