

Scientific/Academic Translation: The Mind of the Domestic Cat

Master's dissertation written by

Nicholas Frederick Nelson Lane

Supervised by

Kevin Patrick Costello



MASTERS IN PROFESSIONAL TRANSLATION
UNIVERSITAT ROVIRA I VIRGILI
TARRAGONA, 2021/2022

Plagiarism Disclaimer

I declare that the assignment here submitted is original except for source material explicitly acknowledged.

I also acknowledge that I am aware of University policy and regulations on honesty in academic work, and of the disciplinary guidelines and procedures applicable to breaches of such policy and regulations, as contained in [the University website](#)

FULL NAME: Nicholas Frederick Nelson Lane

DATE: 25/05/2022

IDENTIFICATION NUMBER: (Passport) LM203426

SIGNATURE: 

Table of Contents

I: Introduction

II: Translation Commentary

2.1. First Draft: HAMT Process

2.2. First Draft Revision.

2.2.1. Readability and Revision Conclusions

2.3. Revising Partner's Translation

2.4. Accepting and Rejecting Corrections

2.5. Project Management

2.6. Receiving Supervisor's Revision: Corrections and Notes

2.6.1. Arriving at a Definitive Version

2.7. Conclusions on the Translation Process

III: The Business Side

3.1. Answering Job Listing

3.2. Communication with Client and Colleagues

3.3. Budget and Invoice Comparison

3.4. Economic Viability

IV: Conclusions

4.1. Motivations

4.2. Lessons

References

Appendix A: Original Text

Appendix B: Translation

Appendix C: Budget (Estimated Cost)

Appendix D: Invoice

I: Introduction

In this translation project I worked with a classmate to translate and revise an academic/scientific article. Firstly, we answered a job advertisement which described a position translating: "10,000-word Spanish academic/scientific articles into English for publication in prestigious international journals". It also highlighted the importance of clarity in translating such articles. I was accepted after applying with a CV, cover letter outlining my expected costs, and pricing guide. I was motivated to apply for this job as I am very interested in scientific topics, and this is an area in which I could see myself specialising in the future. Also, it was one of the few positions available translating from Spanish into English. This is my preference as my native language is English and is the direction I would like to work in professionally. Further, I was interested in applying skills in academic writing, especially with regard to revising, as this has been the area of my work experience during the master's course; I worked for the Language Service at URV, mainly revising academic articles in English.

Originally, I was unaware that I would be working with a partner on this project, but discovered this after the first meeting with our supervisor. The source text we received was a master's thesis about cat psychology titled: *La Mente del Gato Doméstico (Felis Silvestrus Catus)* – written by a Colombian student from the Faculty of Veterinary Medicine and Zootechnics at the Antonio Nariño University in Bogotá. My partner and I decided to divide the text into halves, translate one each, and then revise each other's work. I would do the first part as this featured the English abstract which only needed to be revised; my native language is English, while my partner's is Greek (making revising an easier task for me). To divide the text, we acquired a word count by putting it through a CAT (Computer-Assisted Translation) tool (in my case Memsource) – which came out at 9129 words. This was then divided in half and split into part one and two. This translation would involve a number of steps, before arriving at a definitive version of publishing standard. In this dossier I will describe these steps and what has been challenging, what I have learnt, and my thoughts on the process. I will also discuss the business aspects of this project: answering the original advertisement with a budget and CV, communicating with the client and my partner, and creating an invoice. Lastly, I will compare the budget and the invoice and make conclusions about the economic viability of this project, as well as general conclusions about this translation project.

II: Translation Commentary

2.1. First Draft: HMT Process

To begin the translation process, I started by reading through the original Spanish text in Microsoft Word and familiarising myself with the topic. Next, to translate my half of the text, I decided to use an HMT (Human Assisted Machine Translation) approach. This would involve putting the source text through a CAT (Computer-Assisted Translation) tool, with built in MT (Machine Translation) technology. In a tool like this a window usually appears with the text separated into two columns with the source text on one side, and the MT on the other. The text is also split into small segments roughly equating to a sentence length. In these segments the translator can edit the target text. It is possible to edit the MT provided, completely delete it and start from scratch, or copy and paste segments from another MT tool. I decided to use this HMT approach due to several factors. Firstly, I thought it would be a faster approach, as I lack experience in this subject matter/area. Secondly, due to the type of text it is there is not a lot of metaphoric or creative writing, which means a machine is more likely to translate it well. Thirdly, when I looked for terminology, it would give me a starting point to then see if the machine had given the correct word. This approach is similar to the post-editing process reported on by Green, Heer, and Manning (2013: 439). They found that when translators (of English, Arabic, French and German) edited the output of MT it reduced translation time and increased quality for all the language pairs. Thus, I hoped it would be an effective approach for this project as well.

To do my translation, I decided to use the CAT tool Memsource. This is due to my experience of using it throughout the master's course, in which it has become my preferred option. I like being able to easily analyse a project in order to obtain various statistics needed for creating a budget, such as the wordcount, and repetitions and similarities. Also, I like the general layout of the translation tool, and the ability to see the text as it would look in the final document while translating. Furthermore, I was able to incorporate DeepL (a neural machine translation program) into Memsource as the built-in MT tool. I have found this to be the best quality of those MT tools commonly available. Several studies have also noted the quality of this tool, especially in comparison with

Google Translate (Yulianto & Supriatnaningsih 2021: 109; Volkart, Bouillon & Girletti 2018: 148).

My process to create a first draft in Memsources involved creating a new project and specifying the parameters, such as working from Spanish to English (and the variety of Spanish and English). I then created an analysis for later use in billing. Next, I opened the translation window and began working through each segment of text, carefully reading each segment of the source text and comparing it to the MT supplied by DeepL. During this stage I would edit and fix the MT, as well as deleting sections to write myself. I could also correct problems with terminology, logic, grammar, incorrect translations, and various others. Even at this stage, as I worked, I kept in mind the revision parameters of Mossop (Mossop, Teixeira & Hong, 2020: 136), such as problems of meaning transfer, problems of content, and problems of language and style. These parameters were studied in the master's course and proved very useful when translating and revising texts. A difficulty here was that the source text often had long, convoluted sentences, which could confuse the MT. In fact, the source text's average sentence length was 30 words. Therefore, I often attempted to split long sentences into smaller, more concise parts – as has been recommended in our classes on revision. I also had to avoid unclear antecedents by making sure the target text referred to the correct subject and used the correct pronouns, to make sure the same meaning was conveyed. An example of this can be found in the sentence:

(1) *"Por su parte, la mente sigue siendo una incógnita, aún en animales humanos, y su estudio en animales no-humanos no lleva más que algunas décadas; no obstante, es uno de los tres pilares fundamentales de esta ciencia del bienestar animal."*

Here, we cannot be sure whether the author is saying the mind, or the study of the mind is one of the three fundamental pillars of animal welfare science. However, based on the surrounding context we can safely assume that it is referring to the study of the mind.

In general, I found the machine translation decent and it frequently supplied terminology which appeared to be correct after checking. For example, DeepL translated *"bigotes"* as "whiskers" in reference to cats, which I thought was clever. Also, an example of a more straight-forward, correct translation from DeepL was *"los gatos son animales vivíparos"*, to "cats are viviparous animals".

As this is an academic/scientific text there was specific terminology related to the subject (cats). To check whether terms were correct, or to find the right ones, I used tools such as Linguee (an online multiple language dictionary) and the sources this provides,

similar academic articles on cats (found through searching the online URV library), Wikipedia and the links to source material found there, and general Google searches to find articles and mentions of the words/terminology. Although this text was in the field of science (psychology specifically), there was not an abundance of overly technical terms, which meant not too much time was spent searching for correct terminology. However, some cases proved more difficult, such as the term "*eliminación inadecuada*" – this refers to a pet urinating or defecating in areas different from what they were trained to use. The MT initially translated this as "inadequate elimination", but there were no hits when I searched for this in the URV library database. Therefore, I googled "cats urinating in the wrong area" which led to articles about "inappropriate urination", and from there I found the correct term "inappropriate elimination". I was able to confirm this through articles such as "Advances in Understanding and Treatment of Feline Inappropriate Elimination" (Herron 2010: 195).

The MT, however, often created awkward sentences, and described things in a way which did not seem natural before editing, for example:

(2) "The phenomenon of the animal mind not only causes great curiosity to the scientific world at present, but it would become the determining process to decipher whether there can be such a consciousness about what different species learn and feel."

(3) "Intelligent, elegant or agile are just some of the adjectives we can use to refer to this feline that has adapted to coexisting with humans and living both indoors and in cities, forming what are called colonies."

Sentences like these were quite frequent, which meant there was a lot of work re-translating parts and editing segments so they would make sense. Also, the MT would sometimes miss important subtleties in meaning, which would create confusing sentences.

In fact, the first sentence of the text was an example of this:

(4) "*Con fama de independientes y poco apegados a sus cuidadores, lo cierto es que los gatos son unos excelentes compañeros para cualquier hogar.*"

This was translated as:

(5) "With a reputation for being independent and not very attached to their caregivers, cats make excellent companions for any home."

This MT is a bit nonsensical – why would cats make great companions if they have a reputation like this? This is an example of both what Mossop (Mossop, Teixeira & Hong 2020: 136) refers to as problems of content (lacking logic) and problems of meaning transfer (not sufficiently reflecting the source text's message). It appeared the MT could

often miss subtle meanings, so it was important to pay careful attention to the source and target texts to make sure nothing was being left out or mistranslated. In the prior example, my solution was to translate it as:

(6) "Although cats have a reputation for being independent and not very attached to their caregivers, they can make excellent home companions."

Overall, I did find the MT useful in providing a base to work from, especially when searching for specific terminology. However, it still left a lot of work to do, such as shortening sentence length, improving concision, checking terminology, and making sure the intended meaning was conveyed. I think that the MT often struggled due to the nature of the source text, as the author wrote long, run on sentences, with a lot of nominalisation (using a noun in place of a verb or adjective). Therefore, perhaps I could have improved the process by implementing some pre-editing techniques before putting the source text through the MT.

As I worked through the translation on Memsource, I noticed that it was difficult to judge how well the text flowed and read as a whole. Also, the original author seemed to write in a somewhat disjointed way, with the sentence subjects changing frequently, not many connecting words, and sometimes random information put in/between sentences. An example of this comes from the two first sentences in the subchapter about perception:

(7) *"La percepción es el proceso por el cual un individuo se da cuenta de los estímulos del entorno a través de sus sentidos (Vitale, 2018). A primera vista, ningún miembro de la familia Felidae sería un compañero probable del ser humano."*

I decided it would be easier to face these problems related to style editing while working in Microsoft Word. Therefore, while I worked in Memsource I only attempted to translate the segments to an acceptable level before later revising my draft more in-depth.

After completing this step, I downloaded my translation as a Word file. The average sentence length was 24.5 (which was a bit high). The Flesch reading ease was 30.7 and the Flesch grade level 14.8 – both of which would need to be improved on as well, to make the text easier to read. Although these scores fall in a typical range for an academic paper, I still thought the translation could be made easier to read and therefore clearer. This was important as my client was looking for clarity in the translation.

2.2. First Draft Revision

The next step in my translation process was revising this initial draft. I knew this step would be extremely important because I had not yet applied many copy and style editing guidelines to the text, as in Memource it was difficult to work on in this manner (especially regarding style editing). As I previously stated, the original text appeared quite disjointed, and this was reflected in my first draft. For example (first in the original Spanish, then in first draft form):

(8) *"En cuanto a las características físicas del gato, estamos ante un mamífero cuadrúpedo, con cola, aunque el gato de Manx carece de ella, garras retráctiles y pelo que recubre todo su cuerpo. Posee unos 230 huesos que le permiten una gran flexibilidad y elasticidad."*

(9) "As for a cats' physical characteristics, we are faced with a quadrupedal mammal with a tail. However, the Manx cat lacks a tail, retractable claws and hair covering its entire body. It has about 230 bones that allow it great flexibility and elasticity."

In this example, the mention of the Manx cat appears sudden, and sticks out awkwardly. Not only that, it is unclear afterwards whether the author is saying that cats in general have retractable claws and hair all over their bodies, or whether the Manx cat lacks these traits. Then, again in the next sentence it is unclear whether the author is referring to cats in general, or just the Manx species. Therefore, after my first draft, I decided to remove the mention of the Manx cat, as I felt it was unnecessary and confusing here – especially as this comes from the preamble, where the author is stating general facts about cats, and not entering into specifics. There is also a copy editing mistake in my first draft; it should be "a cat's", not "a cats". My next attempt was as such:

(10) "Regarding a cat's physical characteristics, we are faced with a quadrupedal mammal with a tail. It has about 230 bones that allow it great flexibility and elasticity."

Although I had already attempted to make shorter sentences in my first translation compared to the original Spanish, there were many instances in this revision where I found opportunities to further split long sentences. This helped to lower the overall words per sentence and enhance the readability of my text. An example of this is (first draft, then revision):

(11) The science of animal welfare holds extensive research in the spheres of physical health and behavioural expression (naturalness), but regarding the mental sphere there

is greater complexity and fewer studies, despite being one of the three fundamental pillars of animal welfare.

(12) The science of animal welfare has been researched extensively in the spheres of physical health and behavioural expression (naturalness). However, the mental sphere offers greater complexity and in this area there have been fewer studies, despite it being one of the three fundamental pillars of animal welfare.

A common difficulty in translating from Spanish to English is the use of the passive and impersonal *se*. When revising my first draft, I noticed an example of this, whereby I had originally translated:

(13) "*Se ha demostrado que el temperamento está fuertemente relacionado con la lateralidad motora en el gato*", as: (14) "It has been demonstrated in cats that temperament is strongly related to motor laterality".

In this revision I changed it to:

(15) "Cat temperament has been demonstrated as strongly related to motor laterality". This places "Cat" as the subject and reduces vagueness/verbosity.

Further, this *se* construction also appears several times at the end of the introduction, as the author outlines what is to come in their thesis. The MT offered various strategies for translating these, which I left in my original draft. However, when revising I decided these could be improved. For example, the sentence:

(16) "*Finalmente, se discute la literatura sobre diferentes capacidades cognitivas que se ha demostrado el gato doméstico posee.*"

In my first draft this was:

(17) "Finally, the literature showing the different cognitive abilities possessed by domestic cats is discussed."

This sentence is in passive form and places the verb at the end. This is something which creates more difficulty when reading, as it is more unclear what is being discussed. To create more clarity, I used the active voice and placed the verb at the beginning of the sentence, as such:

(18) "Finally, I discuss the literature showing the different cognitive abilities possessed by domestic cats."

Although in the past the active voice has been discouraged by various scientific journals and tended not to be favoured in academic writing, this perception has changed in recent years. In fact, many journals now encourage the use of the active voice where possible,

such as the American Medical Association and American Psychological Association (Every 2022: Unpaginated).

In one instance the machine translation used the active voice to translate "se". The original sentence was:

(19) *"Luego se revisa la literatura sobre consciencia en general y lo que se puede inferir sobre la del gato",*

and the MT:

(20) "We then review the literature on consciousness in general and what can be inferred about that of the cat."

I thought it was interesting that the MT would choose to use a mixture of passive/active voice. Unfortunately, in this case the author was singular, so it should read "I then review...".

Throughout the original text are examples of nominalisation. This is a common occurrence in Spanish writing, and something which is often carried over into English by the MT. I attempted to avoid this as much as possible in my first draft; however, there were still instances which I could correct in this revision. For example:

(21) "it implies that the observation of the species and its behaviour is of relevance for decision making", became "it implies that observing cats and their behaviour is relevant for decision-making processes".

In this revision stage I also made the simple copy-editing correction of writing small numbers (from zero to ten) as words, as recommended by the Interuniversity Style Guide for Writing Institutional Texts in English (Various Authors 2017: 66). For example:

(22) "we can establish an average weight between 3 and 5 kg", became "between three and five kilograms".

2.2.1. Readability and Revision Conclusions

After revising my initial draft translation, I reviewed the readability statistics again. The words per sentence had lowered to 20.1, while the Flesch reading ease and grade level were 32.8 and 13.5 respectively. The words per sentence showed a marked improvement in conciseness, while the reading ease was improved somewhat.

I was mostly satisfied with this draft. However, there were some areas I was still not sure about and would look for feedback on. For example, I had made a couple of

omissions, which I originally thought were justified as I felt it improved the text – such as removing mention of the Manx cat as discussed earlier. Nevertheless, I began to think I had altered the original too much. Furthermore, I was unsure of how to properly punctuate around quotation marks, and which quotation marks to use when used for emphasis (as there were differing rules described in the Chicago Manual of Style and the Interuniversity Style Guide for Writing Institutional Texts in English). Therefore, I made a note of this uncertainty when sending my translation to my partner and contacted our supervisor for advice on which style guide to follow. Further, when reading through my draft again several days later, I found more corrections I would like to make, so it was clearly not perfect at this stage. To create a document for my partner review, I made a two-column word document with one column of the source text, and one of my translation. This was a bit tricky, as there was no easy way to do this in Memsource. However, I found a way to do it in Word, whereby a table is used and expanded to cover the whole document. I think this worked well for revision purposes; it allowed the reader to easily check between the Spanish and English while correcting.

2.3. Revising Partner's Translation

In the next project phase, my partner and I had to revise each other's translations. To do this we worked in Word, using "Track Changes" on the two-columned document as mentioned. I assumed that my partner would have found it more difficult to create a fluent and idiomatic translation as English is not her native language. For this reason, I made many changes and quite a few suggestions – for example on certain sentences that could be re-translated to make better sense, and phrases which could be expressed in a more idiomatic way. When applying copy and style editing guidelines, I noticed various errors related to translation challenges, and changes I would definitely like my partner to make. For example, with the sentence:

(23) *"esas características de los individuos que describen y explican patrones consistentes de sentimiento, pensamiento y comportamiento"*.

This was first translated as:

(24) "those characteristics of individuals that describe and explain consistent patterns of feeling, thinking, and behaviour".

I thought that this could be improved, simply by changing behaviour to behaving. This would create stronger parallel structure as all the final verbs are gerunds.

Further, I found an example of a tricky word to translate – *"ayudarse"*. In this section it is used as follows:

(25) *"En 2005, Miklósi y col. (citado por Vitale, 2015) experimentaron con perros y gatos para evaluar su capacidad de seguir señales humanas para encontrar la ubicación de una recompensa de comida oculta y para ayudarse a resolver una tarea insoluble."*

My partner first translated it like this:

(26) "In 2005, Miklósi et al. (cited by Vitale, 2015) carried out experiments with dogs and cats to assess their ability to follow human signals to find the location of a hidden food reward and to help them solve an insoluble task."

In this translation I was not sure who "them" was referring to, which created a problem of content. *"Ayudarse"* could either mean help each other or help themselves. Unfortunately, the text did not give any further clues as to whether the cats and dogs were helping each other, just the cats were helping each other, or if they had to do the task by themselves. Therefore, I suggested simply removing "help them" – i.e., "and to solve an insoluble task". I believed no important meaning would be lost, as the author did not further discuss animals helping each other with the task; the important point was about attempting to solve an insoluble task.

As previously noted, the source text had many long sentences, and a much higher average sentence length. My partner did well to reduce this overall; however, I still noticed some instances where long sentences could be split into smaller ones. For example:

(27) "Cats that live socially engage in non-random associations with "preferred associates" (Curtis et al., 2003) and may use "signatures" to distinguish between familiar and non-familiar individuals in order to engage in affiliative or agonistic interactions with these conspecifics".

In my revision I suggested putting a full stop after the brackets and starting the next sentence as: "They may use". This creates two sentences of 15 and 23 words, instead of the original 38.

Further, in some occasions words were given a literal translation, when they had a different meaning in the target text. For instance:

(28) *"no obstante, tenemos ya suficientes luces que nos permiten dilucidar esa incógnita"*, was translated as (29) "However, we already have enough lights that clarify that mystery".

Here lights is translated directly, but I think it is really referring to "insights", or "clues".

At various points in the revision process I made changes to make the text more concise, and to remove nominalisations. For example, I changed:

(30) "In this way, we will be able to make a better management of the spaces in which they live with us", to (31) "In this way, we will be able to better manage the spaces they share with us".

By changing the noun "management" into a verb "manage", an empty (and incorrect) verb is removed as well – "make".

This stage was quite labour intensive for me. In fact, I spent around seven hours working on this revision. As I originally thought I would be working alone, I did not include revision in my quote estimation; however, I did attach my price sheet, which has prices for revision. It was interesting to see how we had confronted similar challenges with the source text, and made me reflect on my own work, and how I could improve it.

2.4. Accepting and Rejecting Corrections

In the next phase, I received my partners corrections and comments. She made a number of good suggestions, as well as various copy and style editing changes. I accepted the majority of these and learnt from some of the comments she left. For example, in this section she suggested I use an en dash instead of a semicolon:

(32) "Among cats' characteristics, their personality stands out; although we will find tremendous variations".

She commented that according to the Chicago Manual of Style, a semicolon is commonly used between two independent clauses. Also, that "although" is a conjunction and does not belong to this group of adverbs which should be preceded by a semicolon when used between independent clauses: then, however, thus, hence, indeed, accordingly, besides and therefore. Thus, in my final translation I put "their personality stands out – although".

Throughout my translation she changed many words from American to British English spelling. We had decided to use this spelling earlier, but I had still misspelt several words, such as optimisation, lateralisation, and vocalisation. This was due to

leaving my document set to American English in Word; I thought I would be able to pick up on any American spellings myself, but this was not the case. Now, I would just make sure to set the document to the correct type of English before starting.

However, I only half agreed with one suggestion my partner made. This goes back to the mention of the Manx cat, which I discussed earlier. I had omitted a fairly large section:

(33) *"con cola, aunque el gato de Manx carece de ella, garras retráctiles y pelo que recubre todo su cuerpo"*.

My partner suggested that I should translate this too, as:

(34) "However, other cat breeds, such as the Manx cat, do not have a tail, retractable claws and hair covering their entire body."

On further inspection, I agreed that I had omitted too much from the original text. However, I was not fully convinced by her translation, as I thought *"el gato Manx carece de ella"*, could just be referring to the tail. Therefore, I searched online and a simple google search revealed that the Manx does in fact lack a tail, but still has fur and claws (Dixon 2022: Unpaginated). Thus, my adjusted translation was:

(35) "Regarding a cat's physical characteristics, we are faced with a quadrupedal mammal with retractable claws, hair covering its entire body, and a tail (although the Manx cat lacks the last trait)."

Here, I learnt that I could save a lot of hassle by simply doing some research.

I think my partner's revision made some valuable improvements to my translation, especially regarding various copy-editing errors and misspellings. Also, I am glad she pointed out the omissions I had made, as I now feel that they add value to the text and should be translated. However, there were still several errors and unidiomatic passages which would be highlighted on revision from our supervisor.

2.5. Project Management

In this project one of us had to be the project manager. This job involved taking both parts of the translation, and assimilating them into one, final, translation. I volunteered to do this, as there were still some niggling changes I wanted to make to my part. I had realised these mistakes after sending my part to my partner for revision. In hindsight, perhaps I should have revised my section more thoroughly before sending it to her. An example of

these corrections is changing my translation of "*los bufidos*" from "snorting" to "hissing". I cannot think of an instance where cats often snort, so this was an oversight on my part.

A difficulty of managing this project was the time difference between my partner and I (and our supervisor in Spain), as I am based in New Zealand while she is in Greece. This makes for a time difference of nine hours, and meant that if we were working to a close deadline I had to be aware of the times we would be unreachable to each other (as we would be asleep). While this can be difficult, it also appears that it could be an advantage in the future – having the ability to work during what is Europe's night could mean future urgent projects are available if I am based in New Zealand.

After combining both our parts into one document, I sent this 'final' version to our supervisor for his appraisal/feedback/comments. Although I was quite happy with this 'final' version, our supervisor had many comments, and suggestions of corrections we could make to further improve our translation.

2.6. Receiving Supervisor's Revision: Corrections and Notes

Upon receiving our supervisor's revision, I was somewhat surprised by the number of comments and corrections throughout. Evidently I still have a lot to learn about translating and revising. In my text redundancies were a common remaining problem. Although I tried to remove these and restructure sentences to be as precise as possible, there were some occasions where I did not pick up on them, or I could not think of a better way to rephrase the sentence. I think this problem was exacerbated due to the writing style of the original text which could be quite verbose, and my use of MT which tends to keep all the redundancies in. Therefore, when editing, I was faced with a lot to fix and some redundancies could remain without me noticing. For instance, going back to a sentence I have mentioned earlier:

(36) "Regarding a cat's physical characteristics, we are faced with a quadrupedal mammal with retractable claws, hair covering its entire body, and a tail".

Our supervisor noted the redundancy of the first statement when the text simply goes on to state several characteristics. A simpler construction would be:

(37) "Cats are quadruped mammals with retractable claws, hair covering their entire body, and tails".

Another, simpler, example of a missed redundancy is:

(38) "This review aims to describe".

This could simply be "This review describes".

Furthermore, our supervisor noted a lack of idiomaticity in some sentences. This is partly due to it just 'sounding right' to me, when in fact it was not quite right. This could be due to a sort of overconfidence from being a native language speaker. I also think that after reading something many times it can begin to sound correct, so it is useful to have outside input to highlight these instances. Our supervisor suggested using the website Ozdic.com to check for idiomaticity and that the correct collocation is being used, which I think is good advice. This website provides a range of collocations for words, relating to how they are used with verbs, adjectives, prepositions, etc. Our supervisor highlighted this sentence for revision:

(39) "Among cats' characteristics, their personality stands out – although we will find tremendous variations depending on the specimen and the experiences it has lived throughout its life."

After checking the website, we were able to come up with the more idiomatic:

(40) "Among cats' characteristics, their personality stands out – although we will find considerable variations depending on the individual and the events it has experienced throughout its life."

There were still a couple of major copy editing problems at this point. One was the lack of consistency in the font of our quotation marks: some were straight, while others were curly. This is due to my partner and I having different settings on our versions of Word. Therefore, in the final revision I made sure they were all one type – curly. Unfortunately, this was a time-consuming activity as I could not find an easy way to do this in Word (and was time I did not charge for). The other problem was our use of comma's. There were many instances where we used prohibited commas and times where we created a non-defining relative clause, when it should have a defining relative clause. An example of this is:

(41) "They evaluated 15 cats' ability to retrieve a treat, which was out of their reach". There should be no comma here. Our supervisor also noted our overuse of discretionary commas (often before conjunctions such as and, because and but), which although not wrong can create an unnecessary pause for the reader if there is no rhetorical or dramatic purpose.

Overall, I found this phase extremely useful. It was great to get feedback from someone with a high level of expertise. Through this I could see areas of my translation

and revision that I really need to work on such as removing redundancies, improving idiomaticity and applying strict copy editing rules.

2.6.1. Arriving at a Definitive Version

After we received feedback from our supervisor, my partner and I both made corrections to our translation. We then read through what each other had done to make sure it was fine, before agreeing on a final, definitive version which we sent to our client. We also each sent a private invoice to our client for the work we had done.

2.7. Conclusions on the Translation Process

Each step of this translation process has taught and reinforced useful skills in translation and revision. By using Memsources and MT I could improve my skills working with these useful tools, while also becoming aware of some of their drawbacks. Next, I could apply style and copy editing guidelines to mine and my partner's drafts, which helped me to better learn them and really see their importance; this was further reinforced after we received feedback from our supervisor and made further corrections. I think by following such guidelines the translation was greatly improved in each stage, to reach a final product of high quality. In fact, I think that through this process we have achieved translation gain in comparison with the source text. By cutting out redundancies and verbosity, reducing sentence length, and improving the conciseness, the overall readability was much improved. This was reflected in improvements to the average sentence length, and Flesch readability score, even after only the first draft revision. In my opinion, through these improvements we have created a translation that is clearer than the original, and is exactly what the job advertisement was requiring – clarity in what the organisation produces for prestigious journals.

Although I had not expected to work with a partner on this project, the experience proved to be valuable as I was able to work on my revision as well as translation skills, and receive feedback and insights on my work. It was interesting to see and compare how we tackled similar translation problems, and the ways we implemented style guidelines to improve our target texts. Through this I could reflect on my own work and the areas in which I can continue working to improve. It was also great to receive feedback from a

highly skilled supervisor and have attention drawn to aspects I had completely missed. The downside of so much collaboration was that many documents were created of the different translation versions at different stages, which could get confusing and lead to time-consuming problems such as having differing symbols for quotation marks throughout the text. Also, it could be difficult to communicate and organise meetings across multiple time zones. I am not sure how projects are usually conducted in professional environments, but it seems that at least having one person to revise your work would be an enormous advantage in creating high quality translations.

III: The Business Side

3.1. Answering Job Listing

Conducting business was an important element of this project. To begin, we had to answer a job listing in a professional manner. The listing I applied for was looking for Spanish-English translators to translate 10,000 word scientific/academic articles to publish in prestigious journals. The listing asked those interested to respond with a CV and an estimated cost for the translation work. As the field was scientific/academic translation I created a CV specifically related to this area; however as I do not have professional experience in this, in my CV I made a list of similar projects I have done throughout this master's course and noted that they were completed while studying. The texts I highlighted were related to medical, technical, scientific and economical translation, as I thought these would be relevant. To make the CV as professional looking as possible, I used a pre-made template that I paid for. I also used a professional template for my letter outlining expected costs. When estimating the cost, I consulted websites such as Proz.com to find out the average rates of Spanish-English specialised language translation and decided to quote €0.10–0.12 EUR per word. However, I noted that I could give discounts for repetitions and similarities within the text as I would be using a CAT tool. Therefore, I quoted €700–1100 EUR, depending on the difficulty of the text and the required deadline. I also attached a price sheet to give more detailed information regarding extra costs like revision work, and fees for urgent deadlines. After sending this I was emailed

shortly after by the client offering me the job. I quickly replied, accepting it in a professional manner.

3.2. Communication with Client and Colleagues

In general, all communications with the client have been professional and straight-forward via email. There was a slight difficulty in the beginning as we were unsure when the project would arrive as the client was waiting to receive texts from outside sources. Also, we were informed that we may only have two weeks to complete our translation. This meant we had to be ready for when a project would come through, and it could have meant that I had a lot of work to do at once – combined with my other English teaching work and my master's internship. Fortunately this was not the case, and we were given more time than originally expected to complete the project. Communication with my partner was easy. We used formal emails to send each other our revisions and comments, and used Whatsapp messenger to contact each other about smaller queries. However, we are in almost opposite time zones, so sometimes had to wait overnight for a response. Our communication with our supervisor was also via email, and was straight-forward and pleasant.

3.3. Budget and Invoice Comparison

There were some major differences between my original quote and the final invoice for this translation. This is mainly due to working with a partner, meaning that I only translated 4552 words instead of more than twice that number (the source text was also slightly shorter than the 10,000 words advertised). Also, as I had to revise my partner's work, I charged hourly revision rates. Fortunately these rates were stipulated in the price guide I sent to the client (€25 EUR p/hour). Furthermore, I did not offer any discounts for repetitions and similarities in my invoice, as analysis' in Memsource and Matecat showed there were almost none of these; I could have given a discount for €1.82 EUR, but this seemed a bit pointless. However, the final price was €721.01 EUR, which did fall in the range I originally quoted but towards the lower end.

3.4. Economic Viability

I have often heard a translator should at minimum be translating 2000 words per day. For this project that would equate to two and a quarters days' work, plus an extra day revising. To earn €700 EUR in that time appears quite lucrative, and well worth the effort. However, in reality I spent a lot more time working on this project. For one thing, translating took me a lot longer as I went through many stages of revising my own work to produce a quality translation. I think with more experience I can greatly improve my efficiency by producing a better translation at my first or second attempt. This would involve such techniques as avoiding redundancies and nominalisations in my first draft. I also spent a fair amount of time doing administrative tasks, such as sending emails and messages, and combining texts into one version of the translation. Although I did not keep an exact count of the hours I spent working, I think it would have easily been a full week, and perhaps one day extra. This still seems like quite good earnings compared to my current work where I usually make \$10–15 USD p/hour through teaching English as a second language online. This also does not include time spent organising lessons and marking students' work. However, it is unlikely that I could charge the translation rates I did, and work on this type of project as a beginning translator without expertise, but hopefully through gaining experience I will also improve my efficiency so that by the time I can work on projects like this I can do so in a lucrative manner. Furthermore, I would like to study science in some capacity in order to have the relevant expertise and opportunities to work on similar projects.

IV: Conclusions

4.1. Motivations

I was motivated to apply for this project as I am interested in scientific topics and would like to gain more expertise in this area to possibly specialise in it. I was lucky with the subject choice, as I am interested in cats, animals and psychology. Therefore, I found the text enjoyable to work on and learnt many interesting things about cat psychology while

working. This helps to confirm that translating scientific/academic work is something I would like to continue pursuing. This is partly because I am a very curious person and see this as an excuse to learn about many interesting topics while working. I also applied for this position due to the translation direction of Spanish to English. Through working on this project I can see that my English can still be improved greatly; therefore I think that working professionally in the other direction would be extremely difficult, especially on a text like this one. Thus, moving forward I will look to translate into English and perfect this, before considering translating in the other direction. I was also interested in revising academic writing as this was similar to my work experience during the master's course. Fortunately, I had ample opportunity to revise and apply style and copy editing guidelines – and receive comments and feedback on my work. This is another area I have enjoyed and in which I will continue working to improve, in order to find professional work.

4.2. Lessons

Each stage of this translation project provided useful lessons to take into account with future translations. Firstly, I could see both positives and negatives of using a CAT tool and MT. Positives included being able to analyse the project to create an invoice, and being given a base to work from by the MT. Negatives included difficulties with creating flow and coherency in the CAT tool, and MT translation creating awkward, convoluted sentences. Next, when revising my own work I became more aware of difficulties translating from Spanish to English, especially in academic papers. These include long sentences, nominalisation and passive sentence structure, and I had to find ways to translate these well. After revising my partner's work and receiving feedback from my work, I was made more aware of various copy and style editing problems that can arise, and how to correct them. Finally, getting an expert revision provided even more insights into the translation and revision process, and how to produce high quality clear translations. I think that through this process we have achieved a quality translation, producing a work that is clearer and more concise than the original; therefore achieving translation gain. On the business side, this project has provided useful experience in applying for work, communicating with clients, communicating with colleagues, and doing business administration.

References

- Anon. 2003. *The Chicago manual of style*. 15th edition. Chicago: University of Chicago Press.
- Dixon, Letricia. Accessed May 2022. "Manx breed of cat". <https://www.britannica.com/animal/Manx-cat>
- Every, Barbara. Accessed May 2022. "Clear Science Writing: Active Voice or Passive Voice?". <http://www.biomedicaleditor.com/active-voice.html>
- Green, Spence, Jeffrey Heer, and Christopher Manning. 2013. "The Efficacy of Human Post-Editing for Language Translation." In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 439–448. ACM.
- Herron, Meghan E. 2010. "Advances in Understanding and Treatment of Feline Inappropriate Elimination." *Topics in companion animal medicine* 25 (4), 195–202.
- Mossop, Brian, Carlos Teixeira, and Jungmin Hong. 2020. *Revising and Editing for Translators*. Fourth edition. London: Routledge.
- Various Authors. 2017. *Interuniversity Style Guide for Writing Institutional Texts in English*. Tarragona: Publicacions Universitat Rovira i Virgili.
- Volkart, Lise, Pierrette Bouillon, and Sabrina Girletti. 2018. "Statistical vs. Neural Machine Translation: A comparison of MTH and DeepL at Swiss Post's Language Service." In *Proceedings of the 40th Conference Translating and the Computer*, 145-150.
- Yulianto, Ahmad, and Rina Supriatnaningsih. 2021. "Google Translate Vs. DeepL: A Quantitative Evaluation of Close-Language Pair Translation (French to English)". *AJELP: Asian Journal of English Language and Pedagogy* 9 (2), 109-27.

Appendix A: Original Text

La Mente del Gato Doméstico *Felis Sivestrís Catus*



PREÁMBULO

Con fama de independientes y poco apegados a sus cuidadores, lo cierto es que los gatos son unos excelentes compañeros para cualquier hogar. Pueden ser tan cariñosos como los perros, pero van a presentar considerables diferencias, no solo físicas. Es básico que conozcan el carácter, el comportamiento y las necesidades, es decir, todas las características del gato, antes de adoptar uno.

Son muchas las cualidades de los gatos. Inteligentes, elegantes o ágiles son solo algunos de los calificativos que podemos utilizar para referirnos a este felino que se ha adaptado a la convivencia con los humanos y a vivir tanto en el interior de sus hogares como en las ciudades, formando lo que se denominan colonias. Los gatos se acercaron a las personas hace unos 10.000 años, atraídos por la abundancia de roedores que rondaban los asentamientos humanos, que se dieron cuenta de la valía del gato para controlar estas plagas, pero, además, en civilizaciones como la egipcia los gatos fueron animales sagrados, dioses y tan respetables como para ser enterrados con honores.

Con el paso de los años, la relación entre gatos y humanos ha ido experimentando distintos altibajos, pero los felinos siempre han logrado adaptarse a cada situación para sobrevivir.

En cuanto a las características físicas del gato, estamos ante un mamífero cuadrúpedo, con cola, aunque el gato de Manx carece de ella, garras retráctiles y pelo que recubre todo su cuerpo. Posee unos 230 huesos que le permiten una gran flexibilidad y elasticidad.

Destacan sus bigotes, que son pelos modificados con función sensitiva.

Su coloración es muy variable y puede ser monocolor, bicolor o tricolor y presentar diferentes patrones atigrados y longitudes. Aunque hay variaciones entre ejemplares y razas más grandes o más pequeñas, podemos establecer un peso medio de entre 3 y 5 kg. Además, los gatos son animales vivíparos, lo que quiere decir que paren a sus crías vivas en camadas de unos 4-5 gatitos que serán alimentados con la leche de su madre durante sus primeras semanas de vida. Destaca también su sentido de la vista, del oído y del olfato, lo que facilita su vida como animal depredador. Su temperatura corporal se encuentra entre 38-39 °C.

Los gatos son animales carnívoros estrictos. Su alimentación en el medio natural se basaba en la caza de roedores, aves y lagartos y no es raro que ocasionalmente ingieran plantas, supuestamente para complementar su dieta.

De entre las características del gato destaca su carácter, aunque encontraremos tremendas variaciones en función del ejemplar y de las experiencias que haya vivido a lo largo de su vida. Podemos destacar su rica comunicación, en la que se incluye el lenguaje corporal y sonidos como los maullidos, los bufidos y los ronroneos. Las feromonas que emite y detecta son otra forma muy importante de comunicación.

Los gatos, excepto la gata y sus camadas, son de hábitos solitarios. Aunque pueden vivir en colonias o colectividades, también es cierto que es una situación que les puede resultar estresante, lo que manifestarán con eliminación inadecuada, peleas, disminución del apetito, etc. Son amantes de las rutinas, por lo que, cualquier cambio debe realizarse tras un período de adaptación. Al contrario que los perros, no requieren el aprendizaje de órdenes básicas, aunque sí conviene establecer unas normas de convivencia y dedicarles tiempo de juego y atenciones.

RESUMEN

La ciencia del bienestar animal posee amplia investigación en las esferas de la salud física y expresión comportamental (naturalidad), pero en lo que respecta a la esfera mental existe una mayor complejidad y menos estudios a pesar de ser uno de los tres pilares fundamentales del bienestar animal. El gato se convirtió en la mascota preferida en gran parte del mundo; sin embargo, se desconoce aún mucho de la especie y entender la mente felina es fundamental para proporcionarle las condiciones de bienestar adecuadas, ya que existe una relación bidireccional entre cognición y bienestar y esta es una especie que requiere ambientes enriquecidos de forma compleja y estimulante. El objetivo de esta revisión fue describir las diferentes investigaciones que a la fecha han buscado entender la mente del gato doméstico *Felis silvestris catus*. La investigación cognitiva realizada en gatos incluye percepción, permanencia de objetos, memoria, causalidad física, cantidad y discriminación de tiempo, sensibilidad de los gatos a las señales humanas, reconocimiento vocal y comunicación, vínculos de apego, personalidad, y salud cognitiva; demostrándose en todos los casos la habilidad del gato en estas áreas. Los estudios en cognición demuestran la capacidad del gato para aprender, hacerlo rápido y modificar su conducta tras este aprendizaje, lo que nos permite además suponer algún grado de consciencia. Se demuestra la sintiencia del gato por su capacidad de experimentar emociones negativas (miedo y dolor) y positivas (alegría, "amistad"). La mente del gato es única y es extremadamente importante usar metodologías de estudio e interpretar resultados dentro del contexto de la especie. Podemos concluir que las investigaciones científicas a la fecha evidencian las capacidades de sintiencia y cognición del gato doméstico, y abren la ventana para que se continúe investigando sobre la mente felina y sus repercusiones en la maximización de su nivel de bienestar y en la otorgación de la protección que merece.

Palabras clave:

Felino, mente, bienestar, cognición, sintiencia

ABSTRACT

The science of animal welfare holds extensive research in the spheres of physical health and behavioral expression (naturalness), but regarding the mental sphere there is greater complexity and fewer studies, despite being one of the three fundamental pillars of animal welfare. The cat became the favorite pet in much of the world. However, there is a lack of research of this species, and understanding the feline mind is essential to provide adequate welfare conditions. In addition, there is a bidirectional relationship between cognition and welfare and this is a species that requires enriched environments in a more complex and stimulating way. The purpose of this review was to describe the different investigations that have tried to understand the mind of the domestic cat *Felis silvestris catus*. Cognitive research conducted on cats includes perception, object permanence, memory, physical causality, quantity and time discrimination, sensitivity of cats to human signals, vocal recognition and communication, attachment bonds, personality, and cognitive health; demonstrating in all cases the ability of the cat in these areas. Studies in cognition have demonstrated the ability of the cat to learn, do quickly and modify his behavior after learning, which also allows us to assume some degree of consciousness. The sentience of the cat is demonstrated by his ability to experience negative (fear and pain) and positive (joy, "friendship") emotions. The cat's mind is unique and it is extremely important to use some methods and interpret results in the context of the species. We can conclude that scientific research to date shows the capacities of sentience and cognition of the domestic cat, and opens the window for further research on the feline mind and its repercussions on maximizing its level of welfare and granting the protection they deserve.

Keywords:

Feline, mind, welfare, cognition, sentience

INTRODUCCIÓN

Se reconoce que las esferas del bienestar animal (física, mental y naturalidad; Fraser, 2008), tienen una interrelación e interdependencia entre sí; sin embargo, se han realizado muchas más aproximaciones y trabajo científico en las esferas física y comportamental (naturalidad), seguramente por su mayor accesibilidad. Por su parte, la mente sigue siendo una incógnita, aún en animales humanos, y su estudio en animales no-humanos no lleva más que algunas décadas; no obstante, es uno de los tres pilares fundamentales de esta ciencia del bienestar animal.

El cerebro humano es una masa de aproximadamente 1,4 Kg, compuesta de unos 100.000 millones de neuronas interconectadas, y es el órgano que hace capaz al humano de reflexionar sobre su propia naturaleza y la del universo. Según el profesor Aznar (s.f.) de la facultad de Psicología de la Universidad de Barcelona, el cerebro de los animales por su parte, es el principal órgano que regula la supervivencia de cada especie, representando en su interior de manera simbólica (cognitivamente) la información que captan los sentidos en 'mapas cognitivos' (patrones neurales).

Los mapas cognitivos han sido clasificados como mapas interoceptivos, propioceptivos o exteroceptivos y proveen información sobre el estado de vísceras, sobre el aparato músculo-esquelético y sobre el estado del mundo exterior, respectivamente (Aznar, s.f.). Los mapas cognitivos son esenciales en la configuración de la mente de un animal que "observa y se observa a sí-mismo", haciendo de la mente de cada animal algo "genuino, personal e intransferible" (Aznar, s.f.). La mente se vale de estos mapas para crear una representación del mundo externo y montar una respuesta consistente. Posteriormente, los mapas quedan en la memoria, y pueden ser revividos a través del recuerdo imaginativo, para planificar e inventar mejores respuestas (Aznar, s.f.) ¿No hacen esto mismo los animales no-humanos, incluyendo los gatos?

Según Ribes (2000), la mente es una entidad no espacial que cohabita funcionalmente con lo físico, y que se representa como experiencia individual. La arquitectura de la mente se conforma entre otros elementos de la memoria, el pensamiento, la imaginación, la atención y la consciencia (Ribes, 2000); por lo tanto, demostrar algunas de estas características en el gato configuraría su mente. El estudio de la mente humana en psicología se hace a través de la teoría de la mente, y según García García (2008) "gracias a la Teoría de la Mente las personas nos comunicamos e interaccionamos, producimos y transmitimos la cultura". Tirapu y col. (2007) reportan que el concepto de teoría de la mente se refiere a la habilidad

para comprender y predecir la conducta de otras personas, sus conocimientos, sus intenciones, sus emociones y sus creencias. El ser humano dispone de capacidades mentales que le permiten interpretar y predecir la conducta de los otros. ¿Tiene el gato esas mismas habilidades?

La inteligencia artificial es una de las tendencias y retos más grandes del mundo moderno. Desarrollar algoritmos que hagan “inteligentes” a máquinas requiere modelos específicos de toma de decisiones. La mente del gato ha sido usada para formular un algoritmo de inteligencia artificial (Cat Swarm Optimization - CSO) (Chu, 2007), con el que, a través del modelado de los comportamientos de gato, se busca resolver los problemas de optimización matemática (selección de la mejor opción, respecto a algún criterio, de un conjunto de elementos disponibles). Lo que ha llamado la atención de los ingenieros es que los gatos tienen un nivel muy alto de alerta, incluso cuando están descansando. Así que dos de los principales rasgos de comportamiento de los gatos se modelan para la propuesta de optimización, estos rasgos se denominan "Modo de búsqueda" y "Modo de seguimiento". La combinación de estos dos modos permite a CSO un mejor rendimiento. Chu (2007) indicó que en el algoritmo propuesto utilizaron “gatos y el modelo de comportamiento del gato para resolver la optimización de problemas, es decir, usamos gatos para representar los conjuntos de soluciones”. Sin entrar en detalles de ingeniería, es, cuando menos, interesante para la discusión que la mente felina sea considerada para un modelo como este, por lo que implica que la observación de la especie y su comportamiento sea de relevancia para la toma de decisiones. ¿Evidencia esto la mente felina y su cognición?

El estudio científico de la consciencia busca explicar una gama de procesos psicológicos, como la integración de información, el foco de atención, el control deliberado de la conducta, la capacidad de un sistema para acceder a sus propios estados internos y la capacidad de informar sobre el estado mental de sí mismo (Chambliss, 2018); la consciencia es pues una capacidad de percibir el mundo, reconocerse y actuar en este. El fenómeno de la mente animal no solo causa una gran curiosidad al mundo científico en el presente, si no que se convertiría en el proceso determinante para poder descifrar si puede existir esa consciencia sobre lo que aprenden y sienten las diferentes especies. Esto sería un gran avance en la comprensión y defensa de los animales no-humanos, y la ciencia del bienestar animal; ya que no solo se probaría el sentir como un proceso bioquímico y neurológico, si no que quedarían de patente no sólo el sufrimiento, sino otras emociones tanto negativas como positivas, como estados mentales. Las actividades mentales son entre otras percibir,

recordar, atender y pensar, la mente al fin de cuentas construye y reconstruye el mundo a partir de las sensaciones y su contacto con el mundo real (Ribes, 2000). Quizá para obtener conclusiones exactas al respecto falte mucho, pero el análisis de los resultados de investigaciones sobre cognición, toma de decisiones, razonamiento, la psiquis, entre otros, comienzan a dar pistas sobre el fenómeno de la mente animal.

Actualmente, el gato doméstico es la mascota más popular en gran parte del mundo; sin embargo, es quizá la especie doméstica en que menos estudios se han realizado en esta área. El objetivo de esta monografía es describir las diferentes investigaciones que a la fecha han buscado entender la mente del gato doméstico *Felis silvestris catus*, y así poder dar respuesta a preguntas como: ¿tienen los gatos capacidades cognitivas? Específicamente, ¿pueden sentir, aprender, recordar y modificar su comportamiento según sus experiencias previas? Se inicia esta revisión abordando la sintiencia y la capacidad del gato doméstico de sentir emociones como el dolor y el miedo. Luego se revisa la literatura sobre consciencia en general y lo que se puede inferir sobre la del gato. Finalmente, se discute la literatura sobre diferentes capacidades cognitivas que se ha demostrado el gato doméstico posee. Siempre que sea posible, se incluyen recomendaciones para futuras investigaciones y consideraciones para mejorar el bienestar de los gatos.

1. SINTIENCIA

Desde Jeremy Bentham (s. XVIII – XIX dc), padre del utilitarismo, y su postulado sobre la importancia de si los animales pueden sentir, más que si pueden pensar o hablar, se inicia un movimiento en torno al bienestar animal que define el desarrollo del término “sintiencia”, comprendida como la capacidad de sentir emociones tanto placenteras como negativas (FAWC, 2014). Actualmente, dos siglos después, no debería ser un desafío tener que probar esta cualidad en ninguna especie, cuando menos de vertebrado superior, con los avances de la neurofisiología y la medicina en general que demuestran los circuitos neuronales, y la bioquímica del dolor y las sensaciones. Hoy se define sintiencia como el tener la consciencia y la capacidad cognitiva necesarias para tener sentimientos (Broom, 2014). Por supuesto, se entiende la complejidad de demostrar la consciencia, el sufrimiento y más aún, la metacognición del individuo animal. Broom (2014) propone que es más probable que a un animal se le considere sintiente si este puede aprender, aprende rápido y comete menos errores después de aprender, lo que debería suponer algún grado de

consciencia. Por aquí iniciaremos el camino para intentar dilucidar la mente y la cognición del gato doméstico.

Los gatos son capaces de experimentar sensaciones de dolor, miedo e incomodidad; los circuitos neuronales análogos al humano para estas sensaciones existen y estudios como el de Moody y col. (2018) muestran cómo presentan respuestas negativas de tipo simpático, como dilatación pupilar y aumento de la frecuencia respiratoria, a la manipulación aversiva. Estos indicadores fisiológicos del bienestar que se asocian al estrés y son evidencia de emociones mentales con valencia negativa; demuestran la capacidad de sentir dolor y miedo del gato frente a una manipulación en la clínica veterinaria que le es aversiva. El mismo estudio, muestra respuestas comportamentales como lamido, cambios de postura o posición de orejas que dependían del tipo de manipulación (aversiva o suave) y del temperamento del gato (amistoso u hostil). Los indicadores comportamentales de bienestar como los nombrados, también son usados para demostrar la valencia (positiva o negativa) de las emociones que experimenta el animal. El comportamiento y las posturas son igualmente indicadores de la emoción que experimenta el animal a su manipulación (Yeates, 2016). Lo anterior, en el gato es particularmente importante, dado lo crítico que puede ser, para este y para el humano que lo manipula, el nivel de estrés que puede presentar el animal; por ello hoy día se habla de proporcionar experiencias “amistosas” para el gato (*catfriendly* o *feline-friendly*) durante su manipulación y toda la experiencia de la atención veterinaria, incluso en su ambiente, como lo reporta Rodan y col. (2011), quienes indican que diferentes técnicas de manejo ambiental y manipulación no aversiva pueden generar menos estrés al gato.

Se ha demostrado que el temperamento está fuertemente relacionado con la lateralidad motora en el gato (uso preferente de una de sus patas delanteras), y que la presencia o ausencia de lateralización se relaciona directamente con la expresión de emoción, independiente de la dirección del sesgo lateralizado. Específicamente, durante una prueba de búsqueda de alimento y test de temperamento, los gatos clasificados como ambilaterales tienden a responder de una manera más temerosa, mientras que los gatos que tenían una preferente lateralización (uso preferente de su pata izquierda o derecha, más no de ambas) fueron animales más confiados. Estos resultados estuvieron alineados con las percepciones de los propietarios de cada gato sobre su personalidad. Los gatos ambilaterales fueron categorizados por sus dueños como animales más agresivos y menos cariñosos, obedientes y amigables. Contrario a los gatos con preferencia lateral, que fueron descritos por sus

dueños como animales amigables y cariñosos. La descripción de temperamentos en este estudio, de la cual se hablará más adelante, y su asociación con la lateralidad es muy interesante; el hecho de que existan tendencias comportamentales según la presencia o ausencia del sesgo lateral, muestra el uso de diferentes regiones anatómicas y de los hemisferios cerebrales, y la descripción de los propietarios sobre la personalidad de los gatos evidencia la presencia de emociones de manera correspondiente con los resultados de los test. (McDowell y col., 2016).

El sexo también ha sido identificado como un factor asociado a la lateralidad en gatos. Wells y McDowell (2019) reportan que los machos tienen preferencia por usar su pata izquierda, mientras que las hembras prefieren la derecha, y estos investigadores buscan entender la relación entre lateralidad y raza, con el fin de conectar las personalidades y temperamentos con esos dos elementos. Los resultados que obtuvieron concuerdan con la teoría de la valencia emocional de la lateralidad, que había sido estudiada por Quaranta y col. (2007) respecto al movimiento de la cola en perros. En ese estudio se mostró la diferencia en la asimetría y amplitud del movimiento de la cola del perro según las emociones causadas por diferentes estímulos visuales. Para el caso de los gatos se demostró una relación entre lateralidad y razas felinas propensas a comportamientos y emociones reactivas, mostrando diferentes patrones de uso de la pata con respecto a gatos y razas con temperamentos menos reactivos. Aunque no se encontró una completa concordancia en tales disposiciones, se abre la puerta a más estudios que puedan determinar estas relaciones y puedan ser un referente para reconocer temperamentos y facilitar la elección de una mascota mejorando así la relación humano-gato y el bienestar de ambos.

El siguiente paso ha de ser investigar sobre cuáles emociones positivas y placenteras es capaz de experimentar un gato, ya que el bienestar animal no se concibe, hoy en día, solo al evitar emociones negativas si no al proporcionarles experiencias con emociones positivas. ¿Puede un gato experimentar placer o alegría? Fermo y col. (2019) buscaron identificar vocalizaciones distintas al maullido (el gato es de las especies más vocales), en relación a una experiencia agradable y una desagradable y para ello usaron un grupo de 74 gatos divididos en 2 grupos. Solo el grupo expuesto a una experiencia positiva (un bocado favorito) produjo vocalizaciones específicas distintas del maullido como trino, chillidos, ronroneos y parloteos, mientras que durante la situación aversiva (transporte en vehículo), no se observó una vocalización distinta a los maullidos. Los autores reportan en sus resultados la

relevancia de usar el estudio de las vocalizaciones para determinar el estado de valencia emocional en gatos.

2. CONSCIENCIA

La comprensión de la consciencia y la mente tanto en humanos como en otras especies sigue siendo una incógnita en estudio. Por lo tanto, es claro que no debemos basar la ciencia del bienestar animal en el supuesto de que comprendemos la consciencia o podemos decidir qué especies son o no conscientes. El bienestar animal es demasiado importante como para esperar hasta que el problema de la consciencia se haya resuelto (Dawkins, 2017). Sin embargo, el bienestar animal puede verse beneficiado de comprender que, si los animales pueden razonar y son capaces de procesos cognitivos, pueden entonces tener consciencia, consciencia de sus emociones, consciencia de lo que sienten y tendría por tanto mayores implicaciones en nuestra responsabilidad en el trato hacia los animales no-humanos. A pesar de las dificultades de estudiar la consciencia animal, no debemos abandonar la búsqueda para llegar a comprender el problema de la relación entre el cerebro y la experiencia en las diferentes especies. En el gato, hay una mayor dificultad por la poca información y estudios al respecto, pero hemos de aprovechar y enfrentar las dificultades de manera objetiva, revisando la información disponible, investigando los mecanismos de comportamiento para intentar concluir si involucran o no vías conscientes, evitando la presión de si es relevante o no para el bienestar animal.

La declaración de Cambridge sobre la consciencia (Low, 2012) concluye que los animales no-humanos, “incluidos todos los mamíferos y aves, y muchas otras criaturas, incluidos los pulpos”, tienen consciencia. En esta, un prominente grupo internacional de neurocientíficos, neurofarmacólogos, neurofisiólogos, neuroanatomistas y neurocientíficos de la computación llegó a esta conclusión tras examinar los sustratos neurobiológicos de la experiencia consciente y otros comportamientos relacionados en seres humanos y animales no-humanos. El gato como mamífero, entra en esta consideración al poseer los sustratos neurológicos que generan la consciencia, aunque se requieren más estudios específicamente con felinos en esta área.

Adicionalmente, hemos de considerar que, para acercarnos a la mente de otra especie, debemos entender como esta comprende, conoce y responde, es decir, tratar de entender la “especeidad” de esa especie y tratar de “ver a través de sus ojos”, o lo que Rollin (2017) llamaría de *“Catness of the cat”* (“la gaticidad del gato”) que aquí nos sirve para llamar la

atención sobre esa necesidad de estudiar y entender al gato desde lo que es; un gato. En efecto, si se comparan los gatos con los perros, estos últimos son seres sociales, y es muy probable que reconozcan a su familia humana como su “manada”, mientras que el gato, a pesar de poder vivir en comunidades, bajo ciertas circunstancias como se ha discutido, sigue siendo un ser individual. Por tanto, quizá no podamos esperar observar en el gato el mismo tipo de respuesta “empática” que si se ha observado en perros, entendiendo el ser empático como un individuo que tiene “la habilidad de entender y compartir los sentimientos de otro individuo” (Cambridge Dictionary), y su ausencia tampoco implicaría una ausencia de capacidad de consciencia sobre el estado del otro. En el capítulo sobre percepción se revisará la evidencia sobre la discriminación del gato para ser empático con su humano, mas no con extraños, y la empatía del perro generalizada a los humanos, lo cual también podría tener relación con el tiempo de domesticación como ya se discutió.

Se han realizado estudios en humanos mostrando que las personas pueden responder emocionalmente a un rostro de forma muy diferente dependiendo de si esa cara muestra una expresión feliz, triste o enojada, incluso cuando no tienen consciencia consciente de haber visto un rostro (Dimberg y col, 2002). Según ese estudio, nuestra capacidad de interpretar la expresión emocional de un rostro humano puede ser bastante inconsciente, como un estímulo que a través del hemisferio derecho alcanza rápidamente la amígdala por vía subcortical, ruta distante de las vías corticales asociadas con consciencia, más similar al procesamiento de estímulos de amenaza. El punto relevante es que los humanos tenemos diferentes vías de procesar información y generar una amplia gama de comportamientos, algunos de los cuales implican consciencia y otros no, por tanto, deberíamos ser cuidadosos al emitir conclusiones al respecto de las observaciones en gatos, más aún por las diferencias entre especies. Por ejemplo, existe diferencia entre la ruta de la experiencia de un sabor y lo agradable que es entre primates y roedores, mientras los primeros lo experimentan en la corteza, en roedores las vías del gusto están conectadas de manera diferente, con conexiones subcorticales que evitan la corteza por completo y hacen conexiones directamente al hipotálamo y la amígdala; así que a pesar de que ambos pueden hacer aprendizajes con el gusto, no podríamos tener certeza de la consciencia de este en roedores (Rolls, 2013), o ¿podría ser que las vías conscientes sean diferentes entre especies? Estudios similares en gatos se discuten en el capítulo de cognición.

Reconocida la dificultad para hablar de consciencia, podemos abordar el problema desde la cognición. Independientemente del nivel de consciencia, es claro que los animales tienen la

capacidad de recibir información a través de los sentidos, procesar, retener y decidir actuar en consecuencia (Broom, 2014). La investigación de la cognición del gato nos puede dar entonces algunas pistas.

3. COGNICIÓN

Aunque millones de gatos conviven con humanos en todo el mundo, la comunidad científica sólo está comenzando a estudiar y comprender la cognición y el comportamiento de estos (Vitale, 2017b). La definición más comúnmente aceptada de cognición, fue proporcionada por la psicología evolutiva como las acciones o procesos mentales que posibilitan la adquisición, procesamiento, almacenamiento y uso de información (Shettleworth, 2010). Por su parte, Vitale (2018) define cognición felina como una amplia gama de experiencias felinas que son parte del comportamiento, incluyendo la detección, percepción, aprendizaje, recordar (memoria) y razonar.

3.1. Percepción

La percepción es el proceso por el cual un individuo se da cuenta de los estímulos del entorno a través de sus sentidos (Vitale, 2018). A primera vista, ningún miembro de la familia Felidae sería un compañero probable del ser humano. La mayoría de felinos llevan vidas solitarias y sólo participan en comportamientos sociales para la reproducción y crianza. Los únicos Felidae que conviven en grupos sociales son los leones (*Panthera leo*), los guepardos (*Acinonyx jubatus*), y en ocasiones, el gato doméstico (*Felis silvestris catus*) que puede mostrar niveles variables de comportamiento social no obligatorio dependiendo de la cantidad de recursos y su crianza (Vitale, 2015). Entonces, ¿cómo se convirtió el gato doméstico en el animal de compañía tan popular que es hoy en día?, con más de 600 millones de gatos viviendo entre humanos en todo el mundo. El gato doméstico acompaña al hombre hace unos 10.000 años (Rodan, 2010), iniciando una relación de amores y desamores. Primero con un mutualismo para el control de roedores a favor del hombre primitivo, que, abandonando el nomadismo, veía amenazado el resultado de sus cosechas. Pasando luego de ser visto como un Dios para los egipcios a ser visto como una señal de mala suerte debido a su relación con brujas y demonios en la Edad Media. El gato no ha pasado desapercibido en la historia. Su propia “animalidad” hacen del felino doméstico una especie difícil de comprender para el humano, más desde la lectura antropocéntrica o en comparación con el bien diferente “mejor amigo del hombre”, el perro doméstico. A este respecto, Galvan (2015) buscó comparar los gatos con la bien documentada capacidad de

los perros domésticos (*Canis lupus familiaris*) para seguir y prestar atención a las expresiones de las emociones humanas. Custance y Mayer (2012) ya habían encontrado que los perros se acercaron e intentaron "consolar" a sus propietarios disgustados, así como a extraños, resumiendo sus resultados como una verdadera "empatía" del perro y, como un condicionamiento operante debido al posible refuerzo obtenido en el pasado por acercarse a sus dueños disgustados, de modo que aprendieron a generalizar la producción de un comportamiento "empático" a cualquier persona en espera del refuerzo. Por su parte, los gatos, aunque mostraron alteraciones en su comportamiento frente al estado de ánimo de sus propietarios, no extendieron su comportamiento positivo al experimentador desconocido, esto podría ser efecto del menor tiempo de domesticación y a su menor socialización con extraños, lo que hace que el gato promedio pudiera tener más fobia a humanos nuevos que el perro promedio (Galvan, 2015). En ese estudio, los gatos no parecieron tener respuestas particularmente positivas a los propietarios "disgustados", pero pasaron más tiempo con sus propietarios "felices", esto, aunque no habla de esa posible "empatía", en el caso de los gatos si nos muestra una preferencia y una interpretación del estado de ánimo del humano. Por otra parte, aunque las comparaciones de este tipo pueden ayudarnos, deben tener en cuenta las diferencias de especie y es posible que las observaciones hayan estado sesgadas a buscar comportamientos típicos del canino que nos son más conocidos, ignorando otras señales que puede mostrar el gato. Por otra parte, puede ser importante tener en cuenta el origen de los gatos, ya que los gatos rescatados o adoptados muestran un nivel de filiación y apego hacia su humano diferente al de un gato criado desde temprana edad con ese humano, lo cual puede afectar su capacidad de interpretar y/o interesarse y reaccionar a sus estados de ánimo.

La interpretación correcta de las emociones de otro individuo es crucial para la interrelación entre ambos. Quaranta y col. (2020) realizaron con gatos los experimentos que anteriormente habían realizado con perros y caballos, para demostrar la interpretación que estos hacían de las emociones humanas. El experimento consistió en mostrar a los gatos durante una situación de tranquilidad, una fotografía de una persona o un gato, que expresaban felicidad o rabia, y simultáneamente rodar un audio con señales auditivas de las mismas emociones que podían o no tener congruencia con la imagen. Los gatos reaccionaron con mayor evidencia a la congruencia entre la imagen y el sonido, demostrando el uso que hacen de estas señales para comunicarse y comprender una situación particular. Estos experimentos nos acercan a la comprensión de las habilidades

sociocognitivas de los gatos para percibir las señales de los individuos de las especies con quien conviven, lo cual sin duda es una ventaja para el bienestar en esa convivencia. Esta habilidad social posiblemente la desarrollaron los gatos dentro del proceso de domesticación (Quaranta y col., 2020).

En 2005, Mikló'si y col. (citado por Vitale, 2015) experimentaron con perros y gatos para evaluar su capacidad de seguir señales humanas para encontrar la ubicación de una recompensa de comida oculta y para ayudarse a resolver una tarea insoluble. Los gatos siguieron con éxito los gestos humanos para obtener una recompensa; sin embargo, cuando no pudieron obtener la recompensa en la tarea insoluble, los gatos persistieron en tratar de resolverla sin dirigir la mirada al humano en busca de señales, lo que hizo sugerir que los gatos no usan al humano como recurso para obtener información y que mirar al humano no sería un comportamiento importante de comunicación. No obstante, un estudio posterior más detallado (Merola y col., 2015) sugiere que los gatos pueden interpretar bien la actitud de su propietario (positiva o negativa) hacia un artículo desconocido. El 79% de los gatos mostraron una mirada referencial entre el dueño y el objeto, y también cambiaron su comportamiento de acuerdo con el mensaje emocional dado por el dueño a través de sus expresiones faciales y comportamiento. Además, el 54% de los gatos mostraron alternancia de mirada cuando el propietario permaneció en silencio y sin reacción al objeto. Esto indica que los gatos sí buscan la referencia en su humano cuando se les presenta un estímulo desconocido, y que pueden discriminar las reacciones de sus propietarios y ajustar su comportamiento a estas. El resultado aparentemente contradictorio de estos experimentos puede deberse a la diferencia de incentivos e información que tenía el gato en cada caso. Es posible que los gatos no usen el mirar cuando esté involucrado el resolver en un problema físico, pero sí busquen referencia del humano cuando tienen miedo o dudas (Vitale, 2015). Además, la investigación ha encontrado diferencias entre las vocalizaciones de gatos de casa y ferales, indicando que la interacción con humanos influye en la comunicación vocal (Yeon y col, 2011), por lo que se requieren más estudios al respecto.

Vitale (2017a), realizó un estudio de preferencia con gatos adultos de 2 poblaciones (caseros y refugio) a los que se les dio a elegir entre: interacción social humana, comida, juguetes o aromas. Se registró la proporción de tiempo interactuando con cada estímulo presentado por separado y luego simultáneamente. Hubo variabilidad individual en la preferencia de los gatos, pero la interacción social con los humanos fue la preferida, seguida de comida, en ambos grupos poblacionales. El estudio de la relación gato-humano desde la perspectiva del

primero, es parte fundamental para entender la cognición y los niveles de consciencia felina. Se requieren más estudios para evaluar la preferencia de estímulos en diferentes ambientes y de motivación para trabajar por ese estímulo; sin embargo, se evidencia la preferencia del gato por la socialización con humanos y su habilidad para interpretar y comunicarse con estos.

Edwards y col. (2007) utilizaron una adaptación de la prueba de situación extraña de Ainsworth para examinar el apego entre gatos domésticos y sus dueños humanos, entendiendo apego como un vínculo social afiliativo y duradero formado entre un animal y un individuo específico (Ainsworth y Bell, 1970). El estudio mostró una mayor preferencia de los gatos por sus propietarios *versus* un extraño en diferentes situaciones, y la presentación de comportamientos como contacto físico, *allorubbing* (frotarse), tocar y vocalizar en compañía del dueño fueron superiores en comparación con el extraño. Incluso hubo un aumento de las conductas independientes como locomoción y exploración del área por la sola presencia del dueño en la misma sala, mostrando que los gatos se sentían más confiados en un ambiente extraño en presencia de sus propietarios, mientras que en su ausencia permanecieron más tiempo quietos y alerta. Otros estudios han mostrado el desarrollo de ansiedad por separación en gatos (ampliamente estudiada en perros). Schwartz (2002) examinó 136 gatos, durante un período de 9 años para determinar si los gatos desarrollaban signos clínicos de ansiedad por separación, encontrando conductas como micción y defecación inapropiadas, vocalización excesiva y destructividad como comportamientos de frecuente presentación en gatos ansiosos. El experimento demuestra conductas de apego del gato hacia su dueño, que incluso bajo la manifestación de un problema de conducta con efectos negativos por la ausencia del dueño, evidencian el vínculo gato-humano, lo cual es relevante para hablar de niveles de emoción y cognición.

Saito y Shinozuka (2013) demostraron que los gatos pueden reconocer y utilizar señales vocales por sí solas para distinguir entre humanos. En su estudio, los gatos debían diferenciar entre el llamado de su humano y el mismo llamado hecho por extraños, en ausencia de la presencia de estos. Se encontró que la respuesta de los gatos se manifestaba dirigiendo sus orejas, en ocasiones su cabeza, o con cambios en el tamaño de las pupilas, al reconocer la voz de sus dueños; sin embargo, no se manifestaron con respuesta de aproximación o movimiento como se encuentra en perros. El estudio ha sido citado en artículos populares para reforzar la idea de que los gatos son “egoístas” e “insensibles” porque no responden a los llamados si no desean hacerlo (Vitale, 2015). No obstante, de

nuevo debemos tener en cuenta las características particulares de la especie y lo que nos interesa es que los gatos pueden diferenciar y responder a señales auditivas; incluso puede ser muy valioso comprender cómo deciden si responder o no y con qué nivel, para acercarnos a la consciencia con que lo hacen.

Para ello es fundamental entender los órganos de los sentidos con los que conoce y se relaciona con el mundo cada especie. En comparación con el humano, los sentidos del gato son mucho más agudos, lo que los convierte en un depredador exitoso. Por ejemplo, los gatos escuchan un rango más amplio de frecuencias, incluyendo ultrasonidos, que les permiten localizar roedores. Sus orejas móviles les ayudan a localizar sonidos (Rodan, 2010). Su visión está adaptada para detectar el movimiento rápidamente, incluso bajo luz tenue. En cuanto al tacto, los gatos tienen unidades epidérmicas (células de Merkel, terminaciones de Ruffian y vibrisas) muy sensibles. Los gatos tienen un excelente sentido del olfato, con 5 a 10 veces más epitelio olfativo que los humanos, y poseen el órgano vomeronasal (órgano de Jacobson), el cual les facilita la percepción de olores que el humano no logra detectar y cumple un papel importante en la reproducción, provocando la respuesta de Flehmen (Rodan, 2010). La comunicación química es esencial para los gatos solitarios que establecen grandes rangos territoriales. Estas señales proporcionan una historia olfativa de los movimientos espaciales, el comportamiento, la salud y el estado sexual de los coespecíficos, lo que permite a los gatos obtener esta información sin contactarse físicamente con el otro individuo. Los gatos que viven socialmente participan en asociaciones no aleatorias con "asociados preferidos" (Curtis y col., 2003) y pueden usar "firmas" para distinguir entre individuos familiares y no familiares con el fin de participar en interacciones afiliativas o agonistas con estos coespecíficos (Vitale, 2017b). Estas "firmas" son sustratos biológicos (por ejemplo, feromonas en material de anidación, orina y heces) con los que los gatos recopilan información social sobre sus congéneres a través de las características químicas de estos sustratos (Vitale, 2017b).

Tradicionalmente se ha sugerido que los gatos son solitarios, pero la investigación ha mostrado que las colonias de gatos domésticos en libertad son grupos sociales más complejos que simples agregaciones aleatorias alrededor de un alimento (Vitale, 2015). Estas relaciones parecen tener que ver con características individuales de la personalidad de cada gato, como lo demuestran Durr y Smith (1997), quienes reportan comportamientos y respuestas consistentes a pesar de los cambios en el entorno de los gatos, indicando que la estabilidad del entorno social no es crucial para mantener la estabilidad del individuo. La

personalidad, según Gosling (2001), se puede definir como “esas características de los individuos que describen y explican patrones consistentes de sentimiento, pensamiento y comportamiento”, en otras palabras, un estado prolongado en el que los patrones de comportamiento son relativamente consistentes en el tiempo y circunstancias, pero pueden ser influenciados dentro de la vida del animal. Otro concepto íntimamente relacionado es el temperamento, que Gosling (2001) describe como “heredado, de aparición temprana y con tendencias que continúan durante toda la vida, sirviendo como fundamento para la personalidad”, y se refiere a las disposiciones biológicas del animal. Los gatos muestran consistentemente temperamento y personalidad. Diferentes autores han reportado consistencia en tres tipos de personalidad (Vitale, 2015), el primer tipo de personalidad describe un individuo sociable, seguro, sencillo, confiado y audaz que inicia interacciones amistosas. El segundo tipo de personalidad son individuos tímidos, nerviosos y “antipáticos”, y la personalidad final involucra a individuos con rasgos agresivos.

Turner y col. (1986) describen que el rasgo de comportamiento de "amistad" es consistente en gatitos de 3 a 8 meses de edad, encontrando correlación entre el temperamento o personalidad de la madre y el padre y el comportamiento de los gatitos hacia los humanos. Este rasgo podría ser aprendido de la madre; sin embargo, y sin negar los elementos del aprendizaje, se encontró correlación con la paternidad, aun en gatitos que no se relacionaron con sus padres. De lo anterior, los autores deducen que existe un componente genético en la personalidad de los gatos. Se puede evidenciar la epigenética de un comportamiento aprendido (“amistad”) que al ser transmitido le hace mucho más exitoso al gato para sobrevivir como especie doméstica. Por su parte Crowell-Davis y col. (2004) describieron como en una colonia de gatos callejeros los individuos tenían asociados preferidos con los cuales preferían pasar más tiempo y tener interacciones afiliativas. Lo que demuestra que los gatos no solo pueden diferenciar a sus coespecíficos individuales dentro de una colonia, sino que también forman relaciones sociales con ciertos individuos más que con otros. Por lo tanto, los gatos son capaces de diferenciar y establecer relaciones con individuos tanto intra como interespecíficamente. Estas habilidades sociales se relacionan con el nivel cognitivo, ya que las relaciones sociales y los vínculos con otros individuos se convierten en un desafío intelectual importante al requerir de aprendizaje sobre el otro y lograr la predicción de sus comportamientos en un contexto determinado con el fin de responder adecuadamente en las interacciones sociales (Byrne & Bates, 2007).

3.2. Memoria y Razonamiento

El concepto de “cuando un objeto desaparece de la vista, continúa existiendo” propuesto por Piaget (1936), se considera un hito cognitivo importante para niños humanos y también puede ser una habilidad cognitiva importante en animales, especialmente aquellos que son cazadores expertos, como los gatos (Vitale, 2015). Si la presa desaparece detrás de un obstáculo que tapa la vista, los gatos se beneficiarían de la capacidad de recordar la ubicación de la presa antes de su desaparición. La investigación indica que los gatos pueden resolver fácilmente los problemas visuales de este tipo (Fiset y Dore, 2006); sin embargo, su memoria de trabajo pareció no ser muy larga comparada con el perro. Los gatos retenidos por un tiempo antes de permitirles buscar el objeto parecían no encontrarlo. Aquí de nuevo debemos tener presente las diferencias entre especies, los gatos se distraen más fácilmente o pierden interés más rápidamente en las actividades que un perro, o simplemente sus intereses son diferentes. Lo anterior puede deducirse del trabajo de Dumas (1992), quien modificó la prueba con una metodología más ecológicamente relevante con un objeto similar a una presa en movimiento, lo cual despertó mayor interés en la tarea que los contenedores típicamente utilizados en pruebas de desplazamiento invisible, donde, y de acuerdo a lo propuesto por Piaget (1936), el objeto desaparece dentro de un contenedor a la vista del sujeto, quien debe elegir el contenedor correcto. En el experimento de Dumas, se usaron 19 gatos, a los cuales se les puso tras un panel transparente para observar un objetivo en movimiento, pero los gatos tenían que caminar alrededor de un panel opaco para alcanzar el objeto. Mientras pasaban por el panel opaco, el objeto era escondido detrás de una de las dos pantallas existentes. Como los gatos no vieron la desaparición del objeto detrás de la pantalla de destino, el objeto quedó oculto de forma invisible. Los resultados mostraron que los gatos resolvían esta tarea con gran flexibilidad, contrastando lo observado en investigaciones anteriores. En la discusión, el autor enfatiza la diferencia entre la tarea típica piagetiana en la cual la información necesaria para tener éxito es retrospectiva, mientras que en la nueva prueba los gatos tenían que anticipar la posición actual del objeto. Esto puede entenderse desde la relevancia ecológica de esta nueva propuesta ya que, aunque la prospección puede conducir a errores (anticipar mal la ubicación), es mucho más apegada a la realidad de un depredador como el gato, que cuando persigue una presa, esta busca escapar alejándose y/o refugiándose. En ese proceso puede cambiar de posición y volver o no a su situación original. Los depredadores deben tomar ventaja de los movimientos de una presa al anticipar nuevos lugares (Dumas, 1992). Por otro lado, la retrospección sería más eficiente para permitir la búsqueda de alimentos

escondidos en una ubicación conocida. Esto demuestra una capacidad cognitiva importante al ser evaluada de acuerdo a la especie en estudio.

Whitt y col. (2009) buscaron determinar si los gatos entendían causalidad física, midiendo su habilidad para aprender a trabajar por una golosina halando una determinada cuerda horizontal. Se evaluó la capacidad de 15 gatos para recuperar una golosina, que estaba fuera de su alcance, en tres configuraciones diferentes: (a) una sola cuerda con recompensa, (b) dos cuerdas paralelas donde solo una tenía recompensa y (c) dos cuerdas cruzadas donde solo una tenía recompensa. Todos los gatos lograron tirar de la cuerda única (configuración a) para obtener la golosina, pero ninguno eligió consistentemente la cuerda correcta en las otras 2 situaciones. No hubo evidencia de que los gatos comprendieran la función de las cuerdas o su causalidad física, o podría cuestionarse la memoria a largo plazo del gato. Sin embargo, los autores concluyen que debe realizarse más investigación para examinar completamente las habilidades de los gatos en este dominio cognitivo, especialmente de nuevo, para garantizar la metodología apropiada para la especie. Los gatos pueden haber encontrado tirar de las cuerdas como algo gratificante en sí mismo, independientemente del premio. Es importante investigar habilidades cognitivas basadas en su importancia para las necesidades ecológicas y etológicas del felino.

3.3. Aprendizaje

Los gatos aprenden de sus experiencias, y podemos influir lo que un gato aprende al afectar lo que experimenta. Los comportamientos deseados pueden ser recompensados, y el comportamiento no deseado ignorado o redirigido. Sabemos que el refuerzo positivo debe ocurrir dentro de 3 segundos del comportamiento deseado; de lo contrario, el gato puede participar en otra actividad y no asociar la recompensa con el comportamiento deseado (Rodan, 2010). Se sabe también que el castigo inhibe el aprendizaje y aumenta la ansiedad. Un gato puede aprender a asociar el dolor o el miedo con el castigo, por ello el castigo nunca debe usarse con gatos. Además, la ansiedad inhibe el aprendizaje, especialmente el aprendizaje de asociaciones positivas (Rodan, 2010).

En cuanto a la vocalización, los gatos la emplean mucho más frecuente cuando los humanos están presentes que cuando están con coespecíficos, lo que probablemente refleja un proceso de aprendizaje, donde el gato sabe que recibe atención o alimento al maullar o ronronear (Turner, 2017). Generalmente, los maullidos son vocalizaciones típicas de búsqueda de atención hacia humanos y con un tono más alto y más agradable que la vocalización equivalente en los gatos salvajes y ferales (Turner, 2017). El gato puede variar

los maullidos y ronroneos en diferentes situaciones y los humanos pueden interpretarlos de manera diferente, según sus propios prejuicios sobre ese sonido. Lo anterior es demostrado por McComb y col. (2009) al estudiar el uso sutil que hacen los gatos del ronroneo para solicitar comida de sus humanos, mostrando que incluso al reproducir grabaciones de ronroneos a humanos no habituados a gatos, estos percibieron una mayor urgencia en el ronroneo de solicitud de alimentos que en otros ronroneos. Así la comunicación interespecífica tiene el potencial de ser un medio eficaz para mejorar el nivel de atención o cooperación que el gato espera recibir (McComb y col., 2009).

Los gatos domésticos pueden ser inducidos a realizar numerosos comportamientos utilizando el condicionamiento tanto pavloviano como operante. Cada vez más la investigación de la cognición del gato proporciona evidencia de sus complejas habilidades socio-cognitivas y de resolución de problemas (Vitale, 2017a). No obstante, todavía existe la creencia común de que los gatos no son especialmente sociables o entrenables. Esta desconexión puede deberse, en parte, a la falta de conocimiento de qué estímulos prefieren los gatos y, por lo tanto, pueden estar más motivados para trabajar por su obtención. Los gatos también pueden aprender a través de observaciones, en un estudio Norton (1974) (citado por Vitale, 2018) mostró como gatitos aprendieron a presionar una palanca en presencia de una luz, para recibir una recompensa de comida, y esto lo aprendieron observando a sus madres o a otro gato adulto, siendo más rápido el aprendizaje en el primer caso. Por otro lado, gatitos que no observaron ni a su madre ni a otro gato adulto (se les dejó participar por ensayo y error), adquirieron la competencia, pero nunca con la misma tasa de éxito que los que aprendieron por observación. Por su parte, los hallazgos presentados por Sherman y col. (2013), confirman que los gatos pudieron ser entrenados con éxito en un laberinto en T adaptado, que combinó componentes motores y cognitivos. En ese estudio 18 gatos fueron entrenados con éxito para superar el laberinto obteniendo recompensas positivas de alimento.

4. DISCUSIÓN GENERAL Y CONCLUSIONES

En los últimos años se ha incrementado el interés por la investigación en felinos, lo cual es, no solo fundamental para la comprensión de la especie, si no para mejorar tanto el bienestar de los gatos como el de los humanos, dado el incremento en la popularidad de estos como mascotas en todo el mundo. Sin embargo, aún falta mucho por estudiar y comprender de esta especie. El fascinante estudio de la mente humana y animal, como ente intangible, del

cual solo podemos tener evidencia a través de sus capacidades y expresiones, es un mundo por explorar en el gato doméstico; no obstante, tenemos ya suficientes luces que nos permiten dilucidar esa incógnita y dar respuesta a las preguntas propuestas sobre si tienen los gatos capacidades cognitivas, si pueden sentir, aprender y recordar. A pesar de que muchos de los estudios aquí citados no son concluyentes, sí tienen hallazgos con implicaciones prácticas para evaluar y mejorar el bienestar del gato y la relación humano-gato.

Hasta ahora la comunidad científica está comenzando a estudiar y comprender la cognición del gato doméstico. Vitale (2018) define cognición felina como una amplia gama de experiencias felinas que son parte del comportamiento, incluyendo la detección, percepción, aprendizaje, recordar y razonar. Por su parte el profesor Broom (2014), reconocido mundialmente por su trabajo en bienestar animal y sintiencia, propone que es más probable que a un animal se le considere sintiente si este puede aprender, aprende rápido y comete menos errores después de aprender. Varios de los estudios descritos en esta revisión nos muestran la capacidad del gato para aprender, hacerlo rápido y modificar su conducta tras este aprendizaje, lo que nos permite además suponer algún grado de consciencia. Otros estudios no concluyentes en esta área deben ser revisados en su metodología para hacerla ecológicamente relevante para los gatos. Este es un elemento clave ya que se debe comprender que la mente, como muchas otras características, son especie-específicas. La mente del gato es única, por tanto, hay que estudiarla desde la perspectiva de este, entendiendo lo que es relevante para la especie.

Hay otros estudios recientes que, aunque tampoco son aún concluyentes, pueden tener implicaciones prácticas para la evaluación del bienestar del gato y la comprensión de sus emociones, como el de Dawson y col. (2019), que buscó llegar a comprender las expresiones faciales felinas. Estas últimas son útiles herramientas para identificar estados afectivos en otras especies; en el gato esto podría ayudar a proporcionar mejores cuidados y comprender mejor sus emociones, fortaleciendo el vínculo humano-gato. Investigar más a fondo y con mayor exactitud cuáles son las expresiones faciales del gato y su significado también permitiría dar respuesta a preguntas cómo ¿son los gatos más expresivos en presencia de humanos que le son familiares o con los que tiene alguna relación?, teniendo en cuenta que parece que los gatos son empáticos con sus humanos familiares, lo que vendría a reforzar que tienen emociones y son capaces de decidir su emoción en contexto.

La investigación cognitiva realizada en gatos incluye percepción, permanencia de objetos, memoria, causalidad física, cantidad y discriminación de tiempo, sensibilidad de los gatos a las señales humanas, reconocimiento vocal y comunicación, vínculos de apego, personalidad, y salud cognitiva (Vitale, 2015), demostrándose en todos los casos la habilidad del gato en estas áreas. Pero no debe perderse de vista la necesidad de usar metodologías e interpretar resultados dentro del contexto de la especie, es decir desde esa “gaticidad del gato”, por ejemplo, se evidencia que los gatos no buscaran la ayuda de su humano para resolver tareas que involucren problemas físicos, como lo hace un perro; sin embargo, frente a la presentación de un estímulo nuevo y ambiguo si utilizarán como referencia al humano mirando su comportamiento.

Con el crecimiento de la población de gatos domésticos, no es extraño que se estén realizando cada vez más investigaciones sobre su cognición; no obstante, todavía queda mucho por aprender sobre cómo los gatos perciben, aprenden y toman decisiones sobre esos aprendizajes. La domesticación altera el comportamiento de una especie y le reta a desarrollar más y mejores habilidades para tener éxito en sus nuevas condiciones. Debe estudiarse más cómo influye la vida social o solitaria sobre la cognición, para entender mejor al gato como miembro de la familia multiespecie, ya que como se mostró, los gatos son capaces de diferenciar y establecer relaciones con individuos tanto intra- como inter-especie.

La capacidad de interpretar las emociones de otros individuos tiene un rol importante en los individuos sociales. Como vimos los gatos mantienen relaciones sociales con individuos de la misma especie y con humanos. Varios estudios han demostrado la capacidad de los gatos para integrar señales visuales y auditivas, para reconocer humanos y coespecíficos, reaccionar a las señales comunicativas humanas y coespecíficas, modulando su comportamiento de acuerdo con la valencia de la emoción que experimentan, lo que demuestra consciencia y procesamiento de la información para aprender de ella y dar una respuesta emocional, esto es lo que evidencia la mente en cualquier especie.

De acuerdo a toda la evidencia encontrada, el gato doméstico (*Felis silvestris catus*), es capaz de sentir, aprender, recordar, actuar y modificar su conducta de acuerdo a las experiencias vividas, así como reconocer y reconocerse. Estos elementos demuestran la mente y las características de la mente en esta especie y por tanto su presencia. Continuar investigando en estas áreas usando metodologías ecológicamente relevantes para la especie, llevará a mejores conclusiones que beneficien su bienestar. Toda esta información sería beneficiosa

para las personas que estén considerando la adquisición de un gato nuevo, posiblemente ayudando a reducir la diferencia entre las expectativas del dueño y el comportamiento del gato, llevando así a relaciones más exitosas, menos abandonos y mayor bienestar. El concepto de “Un Bienestar” (“*One Welfare*”), el cual está enfocado en estrategias para mejorar el bienestar humano y animal (García Pinillos y col. 2016), y de familias multiespecie, toman cada vez mayor relevancia en la relación humano-gato para el bienestar de ambos, por lo tanto, se recomienda seguir investigando sobre la mente del gato, utilizando un mayor número de sujetos y metodologías diseñadas o adaptadas al comportamiento natural del gato, y sus implicaciones sobre las relaciones entre individuos (gatos y humanos), las mejoras del ambiente de tenencia de los gatos domésticos, los recursos que se les proveen para que expresen comportamientos naturales siempre con el objetivo de mejorar su bienestar y su calidad de vida a corto y largo plazo.

5. RECOMENDACIONES

La mente felina sigue siendo una incógnita, y aunque se ha iniciado un camino importante en su comprensión, falta mucho por recorrer para responder preguntas que ayudarán al bienestar de la especie y a su relación con el humano. Sabemos que los gatos pueden modificar su conducta para lograr una mejor comunicación con nosotros, pero ¿hasta qué punto lo hacen y cómo podemos responderles? Se ha probado una importante capacidad cognitiva en la especie, pero ¿hay diferencias cognitivas entre grupos de gatos (salvajes, ferales, refugio, mascota)? La investigación siguiente debería encaminarse a responder preguntas que contribuyan a nuestra comprensión científica de cómo la domesticación, el vínculo con el humano y la adaptación de un el estilo de vida solitario a uno social influyen en la cognición del gato.

Existe aún debate sobre el bienestar del gato de interiores frente al gato en libertad y al gato que se le permite salir de casa libremente. Los argumentos a favor de permitirles la salida se basan en la esfera de la naturalidad y por supuesto tocan también la mental; el comportamiento natural de un felino es predador y exploratorio; salir, cazar y explorar, son entre otros, comportamientos que el gato de interior no puede realizar y que puede pensarse van en contra de su bienestar. Por su parte el gato de interior no está expuesto a graves enfermedades virales y parasitarias, ataques de otros animales, ni a perderse, lo cual también es parte de su bienestar y la de su propietario. Debemos aprender mucho más sobre el gato en libertad y su comportamiento, deben desarrollarse observaciones que nos

permitan saber cómo percibe el gato los espacios humanos y así poder hacer una mejor gestión de los espacios en que conviven con nosotros permitiendo un mayor bienestar del gato de interiores; proveyéndole del enriquecimiento ambiental y nutricional que puedan suplir su necesidad de salir.

Por otro lado, los hallazgos demuestran que los gatos han desarrollado habilidades sociales que les permiten comprender las señales emocionales humanas, factor clave para fortalecer el vínculo humano-gato; ahora bien, sería importante desarrollar estudios que nos permitan comprender las diferentes señales que han desarrollado para comunicarse con nosotros.

Aunque falta mucho por comprender, la literatura actual ha proporcionado una sólida base para futuras investigaciones. El creciente interés de la comunidad científica en este tema, con consideraciones especie específicas y metodologías apropiadas, es probable que nos permita aprender mucho más sobre la cognición del gato en los próximos años.

Appendix B: Translation

The Mind of the Domestic Cat (*Felis Silvestris Catus*)



PREAMBLE

Although cats have a reputation for being independent and not very attached to their caregivers, they can make excellent home companions. They can be as affectionate as dogs, but have considerable differences, and not only physical ones. Therefore, it is essential to know the character, behaviour and needs, or in other words all the characteristics of a cat, before adopting one.

Cats have many qualities. Intelligent, elegant and agile are just some of the adjectives we can use to label this feline that has adapted to coexist with humans, and to live both indoors and outdoors in cities (where they often form colonies). Cats first got close to people around 10,000 years ago, attracted by the abundance of rodents that roamed in human settlements. Soon, these people realized cats' value in controlling pests.

Eventually, in civilizations such as ancient Egypt, cats were revered as sacred animals (even gods), and so respected as to be buried with honours.

Throughout the years, the relationship between cats and humans has experienced various ups and downs, but felines have always managed to adapt to every situation in order to survive.

Cats are quadruped mammals with whiskers (which are modified hairs with a sensitive function), retractable claws, hair covering their entire body, and a tail (though the Manx cat lacks the latter trait). Their 230 bones allow them great flexibility and elasticity. In addition, cats' colouration varies greatly, and can be monocolour, bicolour or tricolour, with different patterns and lengths of stripes. Although there are variations between larger and smaller specimens and breeds, the average weight is between three and five kilogrammes.

Furthermore, cats are viviparous animals. This means that they give birth to live young in litters of about four to five kittens, which will feed on their mother's milk during their first weeks of life. Cats' sense of sight, hearing and smell also stand out, facilitating their life as predatory animals. Their normal body temperature is between 38 and 39 °C.

Cats are mostly strict carnivores. Their diet in the wild was based on rodents, birds and lizards. However, it is not uncommon for them to occasionally eat plants, presumably to supplement their diet.

Among cats' characteristics, their personality stands out – although we will find considerable variations depending on the individual and the events it has experienced throughout its life. We can also highlight their various modes of communication, including body language and sounds such as meowing, hissing and purring. Another important form of communication is through the pheromones they emit.

Cats, except female cats and their litters, are mostly solitary. Although they can live in colonies or collectives, this can be a stressful situation for them and can manifest in ways such as inappropriate elimination, fights, and decreased appetite. They love routines, so any changes should be made after a period of adaptation. Unlike dogs, they do not need to learn basic commands. However, cat owners should establish rules of coexistence, and dedicate time to play and give attention to their pets.

ABSTRACT

The science of animal welfare has been researched extensively in the spheres of physical health and behavioural expression (naturalness). However, the mental sphere offers greater complexity and in this area there have been fewer studies, despite it being one of the three fundamental pillars of animal welfare. Cats have become the favoured pet in much of the world. However, there is a lack of research on this species, and understanding the feline mind is essential to provide adequate welfare conditions. In addition, there is a bidirectional relationship between cognition and welfare. This is a species that requires enriched environments that are complex and stimulating. This review describes the various investigations that have tried to understand the mind of the domestic cat (*Felis silvestris catus*). It includes cognitive research conducted on cats that demonstrates the ability of cats in the areas of perception, object permanence, memory, physical causality, quantity and time discrimination, sensitivity to human signals, vocal recognition and communication, attachment bonds, personality, and cognitive health. Studies in cognition have demonstrated cats' ability to learn and to quickly modify their behaviour after learning. This allows us to assume some degree of consciousness. Cats' sentience is demonstrated by their ability to experience negative (fear and pain) and positive (joy and 'friendship') emotions. The cat's mind is unique, meaning it is extremely important to use specific methods and to interpret results in the context of the species. We can conclude that scientific research to date demonstrates the sentience and cognitive capabilities of domestic cats. This opens the window for further research on the feline mind, which could lead to maximizing cats' level of welfare and cats being granted the protection they deserve.

Keywords:

Feline, mind, welfare, cognition, sentience

INTRODUCTION

The areas of animal welfare (physical, mental, and behavioural; Fraser, 2008) are recognized as interrelated and interdependent. However, there has been far more scientific study in the physical and behavioural spheres, probably due to their greater accessibility. Meanwhile, the mind remains an unknown, even in human animals, while its study in non-human animals has been underway for only a few decades. Nevertheless, the study of the mind is one of the science of animal welfare's three fundamental pillars.

The human brain weighs approximately 1.4 kg, is composed of around 100,000,000,000 interconnected neurons, and is the organ that makes humans capable of reflecting on both their own nature and that of the universe. According to Professor Aznar (n.d.) of the University of Barcelona's Faculty of Psychology, animals' brains are the main organ regulating each species' survival.

The brain internally represents sensory information in cognitive maps (neural patterns) in a symbolic manner (cognitively). Cognitive maps can be classified as interoceptive, proprioceptive, and exteroceptive; these provide information about the state of viscera, the musculoskeletal system, and the external world, respectively (Aznar, n.d.). Cognitive maps are essential in the configuration of an animal's mind which "observes and observes itself", making each animal's mind "genuine, personal and non-transferable" (Aznar, n.d.). Through these maps, the mind constructs a representation of the outside world and assembles a consistent response. Subsequently, the maps remain in memory, and can be retrieved through imaginative recall to plan and build better responses (Aznar, n.d.). Is it possible that non-human animals, including cats, do the same thing?

According to Ribes (2000), the mind is a non-spatial entity that functionally cohabits with the physical and is experienced individually. The architecture of the mind is made up, among other elements, of memory, thought, imagination, attention, and consciousness (Ribes, 2000). Therefore, demonstrating some of these characteristics in cats could help to define their mind.

The human mind is studied in psychology through the theory of mind. According to García García (2008), "thanks to the theory of mind people communicate, interact, produce and transmit culture". Tirapu et al. (2007) state that the theory of mind refers to the ability to understand and predict other people's behaviour, knowledge, intentions, emotions, and beliefs. Thus, human beings have mental capacities that allow them to interpret and predict the behaviour of others. Do cats have the same abilities?

Artificial intelligence is among the biggest trends and challenges of the modern world. Developing algorithms that make machines 'intelligent' requires specific decision-making models. To formulate an artificial intelligence algorithm the feline mind has been used (Cat Swarm Optimization – CSO) (Chu, 2007). This models cat behaviours in the hope of solving mathematical optimisation problems (selection of the best option, regarding certain criteria, from a set of available elements). Even when they are resting, cats have a very high level of alertness, which caught the engineers' attention. Therefore, two of cats' main behavioural traits are modelled for the proposed optimisation. These traits are called 'Search Mode' and 'Tracking Mode' Combining these two modes allows CSO to perform better. Chu (2007) indicated that in the proposed algorithm they used "cats and the cat behaviour model to solve optimisation problems, that is, we used cats to represent solution sets". I will not try to describe the engineering details, but it is at least interesting for the discussion that the feline mind is considered for a model like this: it implies that observing cats and their behaviour is relevant for decision-making processes. Does this testify to the feline mind and its cognition?

The scientific study of consciousness seeks to explain a range of psychological processes, such as the integration of information, the focus of attention, the deliberate control of behaviour, the ability of a system to access its own internal states, and the ability to report on its own mental state (Chambliss, 2018). Consciousness is thus a capacity to recognize oneself, and perceive and act in the world. The phenomenon of the animal mind not only causes great curiosity in the scientific world at present, but its study could be decisive to whether there is such a consciousness behind what different species learn and feel. This would be a great advance in the understanding and defence of non-human animals, and the science of animal welfare; moreover, it would not only prove that feeling is a biochemical and neurological process, but also that suffering and other emotions (both positive and negative) are mental states. Mental activities include perceiving, remembering, attending, and thinking. The mind ultimately constructs and reconstructs the world from sensations and its contact with the real world (Ribes, 2000). Perhaps there is still a long way to go to obtain exact conclusions. However, research results on cognition, decision making, reasoning, and the psyche (among others) are beginning to provide clues about the phenomenon of the animal mind.

Currently, domestic cats are the most popular pet in much of the world. However, when it comes to the mind, they are possibly the domestic species on which the fewest studies have

been conducted. The current paper describes the studies that to date have sought to understand the mind of the domestic cat (*Felis silvestris catus*) in order to answer questions such as: do cats have cognitive abilities? Specifically, can they sense, learn, remember, and modify their behaviour according to previous experiences? This review begins by addressing sentience and domestic cats' ability to feel emotions, such as pain and fear. I then review the literature on consciousness in general, and what can be inferred about that of the cat. Finally, I discuss the literature showing the different cognitive abilities possessed by domestic cats. Whenever possible, recommendations for future research and considerations for improving cat welfare are included.

1. SENTIENCE

A movement around animal welfare began with Jeremy Bentham (18–19th century AD), father of utilitarianism, and his postulate on the importance of whether animals can feel, rather than whether they can think or speak. This has shaped the development of the term 'sentience', understood as the ability to feel both pleasant and negative emotions (FAWC, 2014). Today, two centuries later, it should not be challenging to prove sentience in any species, at least in higher vertebrates. This is due to advances in neurophysiology and general medicine, which have discovered neural circuits, and the biochemistry of pain and sensation. Currently, sentience is defined as having the consciousness and cognitive capacity necessary to have feelings (Broom, 2014). Of course, we can understand the complexity of demonstrating the consciousness, the suffering, and even the metacognition of individual animals. Broom (2014) proposes that an animal is more likely to be considered sentient if it can learn, learn quickly, and make fewer mistakes after learning. This should imply some degree of consciousness. From here we will begin our journey to elucidate the mind and cognition of the domestic cat.

Cats can experience sensations of pain, fear, and discomfort. Human-like neural circuits for these sensations exist, and studies such as that of Moody et al. (2018) show how cats exhibit negative sympathetic-type responses, such as pupillary dilation and increased respiratory rate to aversive manipulation. These physiological indicators of well-being, associated with stress, are evidence of mental emotions with negative valence. They demonstrate cats' capacity to feel pain and fear when they face being handled in the veterinary clinic in a way that is aversive to them. The same study showed behavioural responses such as licking, changes in posture and the positioning of ears that depended on the type of manipulation

(aversive or gentle) and the cat's temperament (friendly or hostile). Behavioural indicators of well-being, such as those mentioned above, are also used to demonstrate the valence (positive or negative) of emotions experienced by the animal. Behaviour and posture are likewise indicators of the animal's emotion in response to its handling (Yeates, 2016). This is particularly important for cats, given how critical the animal's level of stress can be for cats and their human handlers. For this reason, nowadays there is talk of providing 'friendly' experiences for cats during their handling, and their whole experience of veterinary care (Rodan et al., 2011). This is applicable even in a cat's own environment, as reported by Rodan et al. (2011), who state that different environmental management techniques and non-aversive handling can generate less stress in cats.

Cat temperament has been demonstrated as strongly related to motor laterality (preferential use of one front leg). Also, the presence or absence of lateralisation is directly related to the expression of emotion, independent of the direction of the lateralised bias. Specifically, during foraging and temperament tests, cats classified as ambilateral tended to respond in a more fearful manner. In contrast, cats that had preferential lateralisation (preferred use of either their left or right paw, but not both) were more confident animals. These results were aligned with the owners' perceptions of each cat's personality. Ambilateral cats were categorized by their owners as more aggressive, while also less affectionate, obedient, and friendly. On the other hand, cats with lateral preference were described by their owners as friendly and affectionate animals. The description of temperaments in this study, which will be discussed later, and their association with laterality is very interesting. The fact that there are behavioural tendencies according to the presence or absence of lateral bias shows the use of different anatomical regions and brain hemispheres. Moreover, the owners' description of their cat's personality provides evidence for the presence of emotions, in a manner corresponding to the test results (McDowell et al., 2016).

Sex has also been identified as a factor associated with laterality in cats. Wells and McDowell (2019) report that males prefer using their left paw, while females prefer using the right. These researchers sought to understand the relationship between laterality and breed, to connect personalities and temperaments with those two elements. Their results are consistent with the emotional valence theory of laterality, which has been studied by Quaranta et al. (2007) regarding tail movement in dogs. This study showed the difference in the asymmetry and amplitude of dog tail movements, depending on the emotions caused

by different visual stimuli. Regarding cats, a relationship between laterality and feline breeds prone to reactive behaviours and emotions was demonstrated. This showed different patterns of paw use in breeds of cats with less reactive temperaments. Although complete concordance was not found in such dispositions, the door is open to further studies that can determine these relationships. This could provide a reference to recognise temperaments and facilitate choosing a pet, thus improving the human-cat relationship and the welfare of both.

The next step is to investigate what positive and pleasurable emotions a cat can experience. Animal well-being today is understood not only as avoiding negative emotions, but also as providing positive emotional experiences. Can a cat experience pleasure or joy? Fermo et al. (2019) sought to identify vocalisations other than meowing (cats are among the most vocal species), in relation to a pleasant and an unpleasant experience. For this purpose, they used a group of 74 cats divided into two groups. Only the group exposed to a positive experience (a favourite snack) produced specific vocalisations other than meowing, such as trilling, squeaking, purring, and chattering. In contrast, during the aversive situation (vehicle transport), no vocalisation other than meowing was observed. In their results, the authors report on the relevance of studying vocalizations to determine the state of emotional valence in cats.

2. CONSCIOUSNESS

The understanding of consciousness and the mind in humans and other species remains an unknown under investigation. Therefore, we should not base the science of animal welfare on the assumption that we understand consciousness or can decide which species are or are not conscious. Animal welfare is too important to wait until the problem of consciousness has been solved (Dawkins, 2017). However, animal welfare may benefit from understanding that if animals can reason and are capable of cognitive processes, they can then have consciousness, awareness of their emotions, and awareness of what they feel. This would therefore have wide implications for our responsibility in the treatment of non-human animals. Despite the difficulties of studying animal consciousness, we must not abandon the quest to understand the problem of the relationship between the brain and experience in different species. In cats, there is greater difficulty due to little information and few studies on the subject. However, we must take the opportunity to face the difficulties in an objective way. This includes reviewing the available information,

investigating the behavioural mechanisms and trying to deduce whether they involve conscious pathways, and avoiding the pressure of whether it is relevant to animal welfare. The Cambridge Statement on Consciousness (Low, 2012) concludes that non-human animals, “including all mammals and birds, and many other creatures, including octopuses”, have consciousness. This was concluded by a prominent international group of neuroscientists, neuropharmacologists, neurophysiologists, neuroanatomists, and computational neuroscientists after examining the neurobiological substrates of conscious experience and related behaviours in humans and non-human animals. Cats, as mammals, are included in this consideration, as they possess the neurological substrates that generate consciousness. However, more specific feline studies are required in this area.

Additionally, we should consider that to approach the mind of another species we must understand how it comprehends, knows and responds. In other words, we must try to understand the unique qualities of the species and try to “see through its eyes”, or what Rollin (2017) would call, understand the “Catness of the cat”. This draws attention to the need to study and understand the cat in terms of what it is – a cat. Indeed, if cats are compared to dogs, the latter are social beings and are very likely to recognize their human family as their ‘pack’, whereas cats remain individual beings despite being able to live in communities under certain circumstances. Therefore, perhaps we cannot expect cats to show the same type of ‘empathic’ response that has been observed in dogs. If we understand the empathic individual as one who has “the ability to understand and share the feelings of another individual” (Cambridge Dictionary), the absence of an empathic response would not necessarily imply the absence of awareness of another's state. In the chapter on perception, we will review evidence of cats' discriminatory ability to be empathetic to their owner, but not to strangers. We will also discuss dogs' general empathy towards humans, which may also be related to their domestication time.

Studies on humans have shown that people can respond emotionally to a face very differently. Their response depends on whether that face shows a happy, sad, or angry expression – even when they are not consciously aware of having seen a face (Dimberg et al., 2002). According to Dimberg et al. (2002), our ability to interpret the emotional expression of a human face may be unconscious. A stimulus through the right hemisphere quickly reaches the amygdala via a subcortical pathway, a route distant from the cortical pathways associated with consciousness, more like the processing of threat stimuli. Here, the key point is that humans have different ways of processing information and generating

a wide range of behaviours, some of which involve consciousness and some of which do not. Therefore, we should be cautious about drawing conclusions from observations in cats, especially given the differences between species. For example, in primates and rodents there is a difference between the route of experiencing a taste and how pleasant it is. While the former experience it in the cortex, in rodents the taste pathways are wired differently, with subcortical connections bypassing the cortex altogether and making connections directly to the hypothalamus and amygdala. Thus, even though both can do taste learning, we could be uncertain about taste consciousness in rodents (Rolls, 2013). Or could it be that conscious pathways are different between species? Similar studies in cats are discussed in the chapter on cognition.

Recognising the difficulty in describing consciousness, we can approach the problem from the perspective of cognition. Regardless of the level of consciousness, it is clear that animals have the ability to receive, process and retain information through the senses, and decide to act accordingly (Broom, 2014). Research on the cognition of cats may then give us some clues.

3. COGNITION

Although millions of cats live with humans worldwide, the scientific community is only now beginning to study and understand cats' cognition and behaviour (Vitale, 2017b). The most widely accepted definition of cognition was provided by developmental psychology: the mental actions or processes that enable acquiring, processing, storing and using information (Shettleworth, 2010). Vitale (2018) defines feline cognition as a broad range of feline experiences that are part of behaviour. These include sensing, perceiving, learning, recalling, and reasoning.

3.1. Perception

Perception is the process by which an individual becomes aware of stimuli in the environment through their senses (Vitale, 2018).

At first glance, no member of the Felidae family would be a likely companion for humans. Most felines lead solitary lives and engage in social behaviour only for breeding and child-rearing. The only Felidae that coexist in social groups are lions (*Panthera leo*), cheetahs (*Acinonyx jubatus*), and occasionally, domestic cats (*Felis silvestris catus*) – which may show varying levels of non-compulsory social behaviour depending on the available resources and how they were raised (Vitale, 2015). So, with more than 600 million cats living among

humans worldwide, how did the domestic cat become the popular companion animal it is today?

The domestic cat has been with humans for about 10,000 years (Rodan, 2010), during which a love-hate relationship has developed. First, a mutually beneficial rodent control system existed. This favoured primitive humans, who after abandoning nomadic life saw their harvest yields being threatened. Cats then went from being seen as gods by the Egyptians to being seen as signs of bad luck, due to their relationship with witches and demons in the Middle Ages. The cat has not gone through history unnoticed. Its own 'animality' makes the domestic feline difficult to understand for humans. This is especially the case from an anthropocentric reading, or in comparison with the very different 'man's best friend' – the domestic dog. In this regard, Galvan (2015) sought to compare cats to domestic dogs' (*Canis lupus familiaris*) well-documented ability to track and pay attention to expressions of human emotion. Custance and Mayer (2012) had already found that dogs approached and attempted to 'comfort' their disgruntled owners as well as strangers, summarizing their results as true dog 'empathy'. This was seen as operant conditioning due to possible reinforcement obtained in the past by dogs approaching their disgruntled owners. Therefore, they learned to generalize the production of 'empathetic' behaviour to anyone, in expectation of reinforcement. However, although cats showed alterations in their behaviour according to the mood of their owners, they did not extend their positive behaviour to unknown experimenters. This could be an effect of cats' shorter domestication time and less socialization with strangers, which makes the average cat more phobic to new humans than the average dog (Galvan, 2015). In that study, cats did not seem to have particularly positive responses to 'upset' owners, but spent more time with their 'happy' owners. Although this does not directly imply possible 'empathy' in cats, it does demonstrate preference and interpretation of their owner's mood. Nonetheless, although comparisons of this type can help us, we must consider species differences. It is possible that these observations have been biased to look for typical canine behaviours that are more familiar to us, while ignoring other signs that cats may show. Furthermore, it may be important to consider the cats' origin. Rescued or adopted cats show a different level of affiliation and attachment to their owner than a cat raised from an early age with that human. This may affect their ability to interpret and/or be interested in and react to their owner's moods.

Correctly interpreting another individual's emotions is crucial in an interrelationship. Quaranta et al. (2020) conducted the same experiments with cats they had previously carried out with dogs and horses to interpret human emotions. The experiment consisted of showing the cats – in a quiet situation – a photograph of a person or a cat expressing happiness or anger. Simultaneously, they played audio with signals of the same emotions that may or may not be congruent with the image. Cats reacted more intensely to the congruence between image and sound, demonstrating their use of these signals to communicate and understand a particular situation. These experiments help us understand the social-cognitive abilities of cats. Undoubtedly, this is an advantage for the well-being of the cat-human coexistence, as through these experiments the cats perceive the signals of individuals with whom they live. Cats possibly developed this social skill within the domestication process (Quaranta et al., 2020).

In 2005, Miklósi et al. (cited by Vitale, 2015) carried out experiments with dogs and cats, assessing their ability to follow human signals to find the location of a hidden food reward and to solve an unsolvable task. Cats successfully followed human gestures to earn a reward. However, when they could not earn the reward for the unsolvable task, cats persisted in trying to solve it without looking at the human for signals. This suggested that cats do not use the human as a resource to obtain information and that looking at the human would not be an important communicative behaviour. However, a more detailed later study (Merola et al., 2015) suggests that cats may interpret their owner's attitude (positive or negative) towards an unknown object well. Most cats (79%) exhibited referential looking between the owner and the object and changed their behaviour in line with the emotional message given by the owner's facial expressions and behaviour. In addition, 54% of the cats showed gaze alternation when the owner remained silent and did not react to the object. This indicates that cats do look for reference in their owner when they are presented with an unknown stimulus. It also reveals that they can differentiate between the reactions of their owners and adjust their behaviour accordingly. The apparently contradictory results of these experiments may be attributed to the difference in incentives and information that the cat had in each case. Cats may not use looking when involved in solving a physical problem, but they do seek reference from humans when they are afraid or in doubt (Vitale, 2015). In addition, research has found differences between the vocalisations of house and feral cats, indicating that human interaction influences vocal communication (Yeon et al, 2011). Thus, further studies are needed on that matter.

Vitale (2017a) carried out a preference study with adult cats from two populations (pet and shelter). She gave cats a choice between human social interaction, food, toys or scent. In this study, the proportion of time interacting with each stimulus – presented separately and then simultaneously – was recorded. In both populations, cats' individual preferences varied, but social interaction with humans was the most preferred stimulus, followed by food. The study of the cat-human relationship from the perspective of the former is a fundamental part of understanding cognition and the levels of feline consciousness. More studies are needed to evaluate the preference for stimuli in different environments and the motivation to work for that stimulus. However, the cat's preference for socialisation with humans and its ability to interpret and communicate with them is evident.

Edwards et al. (2007) used an adaptation of the Ainsworth Strange Situation Test to examine attachment between domestic cats and their owners. In this adaptation, attachment is understood as an affiliative and lasting social bond formed between an animal and a specific individual (Ainsworth and Bell, 1970). The study showed cats' greater preference for their owners versus a stranger in different situations. Additionally, behaviours such as physical contact, rubbing, touching, and vocalising were higher in the company of the owner compared to the stranger. There was even an increase in independent behaviours, such as locomotion and exploration of the area, due to the mere presence of the owner in the same room. This showed that the cats felt more confident in an unfamiliar environment in the presence of their owners, while in their absence they remained more quiet and alert. Other studies have shown the development of separation anxiety in cats (extensively studied in dogs). Schwartz (2002) examined 136 cats over a period of nine years to determine whether cats developed clinical signs of separation anxiety. She found that behaviours such as inappropriate urination and defecation, excessive vocalisation, and destructiveness frequently occur in anxious cats. The experiment demonstrates the cat's attachment behaviours towards its owner. Even when the owner's absence causes behaviour problems to the cat with negative effects, these behaviours highlight the cat-human bond, which is relevant when talking about levels of emotion and cognition.

Saito and Shinozuka (2013) demonstrated that cats can recognise and use vocal signals alone to distinguish between humans. In their study, the cats had to differentiate between the call of their owner and the same call made by strangers, without their physical presence. The study revealed that cats responded by moving their ears (and sometimes their head) or changing the size of their pupils when recognising the voice of their owners; however, unlike

dogs, they did not respond by approaching or moving towards their owners. The study has been cited in popular articles to reinforce the idea that cats are 'selfish' and 'insensitive' because they do not respond to calls if they do not wish to do so (Vitale, 2015). However, again we must consider the particular characteristics of the species and the most interesting fact is that cats can differentiate and respond to auditory signals; it could even be valuable to understand how they decide whether or not to respond and at what level, to bring us closer to comprehending the consciousness with which they act.

To do this, it is essential to understand the sense organs with which each species knows and relates to the world. Compared to humans, cats' senses are much sharper, making them successful predators. For example, cats hear a wider range of frequencies, including ultrasounds that allow them to locate rodents. Their mobile ears help them locate sounds (Rodan, 2010). Their vision is adapted to detect motion quickly, even in dim light. As for touch, cats have very sensitive epidermal units (Merkel cells, Ruffini endings and whiskers). Cats also have an excellent sense of smell, with five to ten times more olfactory epithelium than humans, and possess the vomeronasal organ (Jacobson's organ). This organ facilitates the perception of smells that humans fail to detect and plays an important role in reproduction by causing the Flehmen response (Rodan, 2010). Chemical communication is essential for solitary cats that establish large territorial ranges. These cues provide an olfactory history of spatial movements, behaviour, health, and conspecific sexual status, allowing cats to obtain this information without physically contacting others. Cats that live socially engage in non-random associations with 'preferred associates' (Curtis et al., 2003). They may use 'signatures' to distinguish between familiar and non-familiar individuals in order to engage in affiliative or agonistic interactions with these conspecifics (Vitale, 2017b). These 'signatures' are biological substrates, such as pheromones in nesting material, urine, and faeces. With these, cats collect social information about their congeners through the chemical characteristics of these substrates (Vitale, 2017b).

Traditionally, it has been suggested that cats are solitary. Nonetheless, research has shown that the colonies of domestic cats in the wild are more complex social groups than simple random aggregations around food (Vitale, 2015). These relationships seem to relate to the individual characteristics of each cat's personality, as Durr and Smith demonstrate (1997). They report consistent behaviours and responses, despite changes in the cat environment, which indicates that the stability of the social environment is not crucial to maintain the stability of the individual. Personality, according to Gosling (2001), can be defined as "those

characteristics of individuals that describe and explain consistent patterns of feeling, thinking, and behaving". In other words, personality is a prolonged state in which patterns of behaviour are relatively consistent in time and circumstances, but can be influenced within the animal's life. Another closely related concept is temperament. Gosling (2001) describes it as "inherited, of early appearance and with tendencies that continue throughout life, serving as a foundation for personality". It also refers to the biological dispositions of the animal. Cats consistently display temperament and personality. Numerous authors have reported consistency in three types of personality (Vitale, 2015). The first type describes a sociable, safe, simple, confident, and bold individual who initiates friendly interactions. The second type of personality describes shy, nervous, and unfriendly individuals. Lastly, the third type involves individuals with aggressive traits.

Turner et al. (1986) report that the behavioural trait of 'friendship' is consistent with kittens from three to eight months of age. The authors find correlation between the temperament or personality of the mother and father, and the behaviour of kittens towards humans. This trait could be learned from the mother; however, without denying the elements of learning, correlation was found with paternity, even in kittens that did not have contact with their fathers. From the above, the authors deduce that there is a genetic component in the personality of cats. The epigenetics of a learned behaviour ('friendship') can be demonstrated, and this behaviour – since it is transmitted – makes the cat much more successful in surviving as a domestic species. Crowell-Davis et al. (2004) described how – in a colony of stray cats – individuals had preferred associates with whom they preferred to spend more time and have affiliative interactions. This shows that cats can not only differentiate their individual conspecifics within a colony, but also form stronger social relationships with certain individuals. Therefore, cats are able to differentiate and establish relationships with individuals both intra and interspecifically. These social skills are related to cognitive level, as social relationships and bonds with other individuals become an important intellectual challenge. Social bonds constitute a challenge, as they require learning about others and predicting their behaviour in a given context, in order to respond appropriately in social interactions (Byrne & Bates, 2007).

3.2. Memory and Reasoning

The concept of "when an object disappears from sight, it continues to exist" proposed by Piaget (1936) is considered an important cognitive milestone for children. It can also be an important cognitive skill in animals, especially those which are expert hunters, such as cats

(Vitale, 2015). If the prey disappeared behind an obstacle that obscures vision, cats would benefit from the ability to remember its location before its disappearance. Research indicates that cats can easily solve visual problems of this type (Fiset and Dore, 2006); however, their working memory did not seem to be very long compared to dogs' memory. The cats that were held for a while before being allowed to search for the object seemed not to find it. Again, at this point we must keep in mind the differences between species; cats are more easily distracted or lose interest in activities more quickly than dogs – or their interests are simply different. This can be deduced from the work of Dumas (1992), who modified the above test using a more environmentally relevant methodology with a moving prey-like object. This object aroused greater interest in the task than the containers that are typically used in invisible displacement tests where, in accordance with Piaget (1936), the object disappears inside a container in full view of the subject, who must choose the correct container. In the Dumas experiment, 19 cats were used. These were placed behind a transparent panel to observe a moving target, but the cats had to walk around an opaque panel to reach it. As they passed by the opaque panel, the object was hidden behind one of the two existing screens. As the cats did not perceive the disappearance of the object behind the target screen, the object was invisible. The results showed that cats solved this task with great flexibility, contrasting what was observed in previous research. In the discussion, the author emphasizes the difference between the two tests. In the typical Piagetian task, the information needed to succeed is retrospective, while in the new test the cats had to anticipate the current position of the object. This can be understood from the environmental relevance of this new approach: although searching can lead to mistakes (such as badly anticipating the prey's location), it is much closer to the reality of a cat, which, when it chases a prey, the prey seeks to escape by moving away and/or taking refuge. In this process the prey may change position and return to its original location. Predators must take advantage of preys' movements by anticipating new places (Dumas, 1992). On the other hand, retrospection is more efficient when searching for food hidden in a known location. This demonstrates an important cognitive ability, as it is evaluated according to the species under study.

Whitt et al. (2009) sought to determine whether cats understood physical causality by measuring their ability to learn to work for a treat by pulling a horizontal string. They evaluated 15 cats' ability to retrieve a treat which was out of their reach, in three different configurations: (a) a single reward rope, (b) two parallel ropes where only one had a reward

and (c) two overlapping ropes where only one had a reward. All the cats managed to pull the single rope to get the treat, but none consistently chose the correct rope in the other two situations. There was no evidence that the cats understood the function of the ropes or their physical causality or that their long-term memory of the cat could be evaluated. However, the authors concluded that more research should be done to fully examine the abilities of cats in this cognitive domain, especially to again ensure the appropriate methodology for the species. Cats may have found pulling the strings rewarding, regardless of the prize. It is important to investigate cognitive skills based on their importance to the environmental and ethological needs of the feline.

3.3. Learning

Cats learn from their experiences. Consequently, we can influence what a cat learns by affecting what it experiences. Desired behaviours can be rewarded, and unwanted ones ignored or redirected. We know that positive reinforcement should occur within three seconds of the desired behaviour; otherwise, the cat may engage in another activity and not associate the reward with the desired behaviour (Rodan, 2010). We also know that punishment inhibits learning and increases anxiety. A cat can learn to associate pain or fear with punishment, so punishment should never be used on cats. In addition, anxiety inhibits learning, especially learning from positive associations (Rodan, 2010).

As for vocalisation, cats use this device much more frequently when humans are present than when they are with conspecifics. This probably reflects a learning process, where the cat knows that it receives attention or food when it meows or purrs (Turner, 2017). Usually, meows are typical attention-seeking vocalisations towards humans, and are higher pitched and more pleasant than the equivalent vocalisation in feral and wild cats (Turner, 2017). Cats can vary their meowing and purring in different situations, and humans can interpret them differently, depending on their own prejudices about these sounds. This was demonstrated by McComb et al. (2009) when studying cats' subtle use of purring to request food from their owners. The authors showed that even when playing recordings of purrs to humans not habituated to cats, they perceived a greater urgency in food-solicitation purring than in other purring. Thus, interspecific communication has potential to be an effective means of improving the level of attention or cooperation that the cat expects to receive (McComb et al., 2009).

Increasingly, cat-cognition research provides evidence of the cat's complex socio-cognitive and problem-solving skills (Vitale, 2017a). Domestic cats can be induced to perform

numerous behaviours using both Pavlovian and operant conditioning. However, there is still a common belief that cats are not particularly sociable or trainable. This disconnection may be partly due to a lack of knowledge of which stimuli cats prefer and may therefore be more motivated to attain. Cats can also learn through observations. Norton (1974) (cited by Vitale, 2018) showed how kittens learned to press a lever in the presence of a light in order to receive a food reward. They learned this by observing their mothers or another adult cat – learning faster in the first case. On the other hand, kittens which did not observe either their mother or another adult cat (they were allowed to participate by trial and error) gained competence, but never with the same success rate as those which learned by observation. Lastly, the findings that Sherman et al. presented (2013) confirm that cats could be successfully trained in an adapted T-maze which combined motor and cognitive components. In that study, 18 cats were successfully trained to walk through the maze by earning positive food rewards.

4. GENERAL DISCUSSION AND CONCLUSIONS

In recent years, there has been a growing interest in feline research. This is fundamental not only to understanding the species, but also to improving the welfare of both cats and humans – especially as the popularity of cats as pets has increased globally. However, there is still much to study and understand about this species. The fascinating study of human and animal minds as intangible entities is a field that has not yet been fully explored, as we can have evidence of the feline mind only through its abilities and expressions. However, we already have enough insights that clarify this mystery and give answers to the proposed questions about whether cats have cognitive abilities – if they can feel, learn and remember. Although many of the studies cited here are inconclusive, they do have findings with practical implications for assessing and improving cat welfare and the human-cat relationship.

Only now is the scientific community beginning to study and understand domestic cats' cognition. Vitale (2018) defines feline cognition as a wide range of feline experiences that are part of behaviour. These include detection, perception, learning, remembering, and reasoning. Professor Broom (2014), recognised worldwide for his work on animal welfare and sentience, suggests that an animal is more likely to be considered sentient if it can learn, learn quickly and make fewer mistakes after learning. These cats' abilities are shown in several studies described in this review. This also allows us to assume some degree of

awareness. Other inconclusive studies in this area should review their methodology to make them environmentally relevant to cats. This is a key element, since it must be understood that the mind, like many other characteristics, is species-specific. The cat's mind is unique; therefore, it must be studied from its own perspective, understanding what is relevant to the species.

There are other recent studies that, although not yet conclusive, may have practical implications for evaluating the welfare of the cat and understanding its emotions. One example is that of Dawson et al. (2019), who sought to understand feline facial expressions. Understanding expressions is a useful tool to identify affective states in other species; in cats this could help provide better care and a better understanding of their emotions, thus strengthening the human-cat bond. Further and more precise research into cat facial expressions and their meaning would also allow us to answer questions such as: “are cats more expressive in the presence of humans that are familiar or with whom they have a bond?” We should consider that it seems cats are empathetic towards familiar humans, which would reinforce the idea that they have emotions and are able to display them in context.

Cognitive research carried out in cats includes perception, object permanence, memory, physical causality, quantity and time discrimination, and sensitivity to human signals. It also includes vocal recognition and communication, attachment bonds, personality, and cognitive health (Vitale, 2015). The research thus demonstrates the ability of the cat in all these areas. However, we must not lose sight of the need to use methodologies and interpret results within the context of the species, that is, from the ‘catness of the cat’. For instance, it is evident that unlike dogs, cats will not seek the help of their owner to solve tasks that involve physical problems; however, when presented with a new and ambiguous stimulus, they will use humans as a reference by looking at their behaviour.

With the growth of the domestic cat population, it is not surprising that more and more research is being done on their cognition; nevertheless, there is still much to learn about how cats perceive, learn, and make decisions about these learnings. Domestication alters a species' behaviour and challenges it to develop new and improved skills to succeed in its new conditions. There should be more research on how social or solitary life influences cognition in order to better understand the cat as a member of a multispecies family. As researchers have shown, cats can differentiate and establish relationships with individuals both intra- and inter-species.

The ability to interpret other individuals' emotions plays an important role in social individuals. As we have seen, cats have social relationships with individuals of the same species and with humans. Several studies have demonstrated cats' ability to integrate visual and auditory signals, to recognize humans and conspecifics, and to react to human and conspecific communicative signals – modulating their behaviour according to the emotional valence they experience. This demonstrates awareness and processing of information to learn and give an emotional response; this is what the mind demonstrates in any species. According to all the evidence found, the domestic cat (*Felis silvestris catus*) is able to feel, learn, remember, act and modify its behaviour according to its experiences. It can also recognise others and recognise itself. These elements demonstrate the mind and its characteristics in this species and therefore its presence. Further research in these areas – using methodologies environmentally relevant to the species – will lead to improved conclusions that benefit its welfare. All this information would be beneficial for people considering acquiring a cat. Possibly, these data would help to reduce the difference between the owner's expectations and the cat's behaviour. Therefore, this will lead to more successful relationships, less abandonment and greater well-being. The concept of 'One Welfare', which focuses on strategies to improve human and animal welfare (García Pinillos et al. 2016) and that of multispecies families, is becoming increasingly important in the human-cat relationship for the well-being of both. Therefore, I recommend that we continue researching the cat's mind, using a greater number of subjects and methodologies designed or adapted to the natural behaviour of the cat. I also recommend that we investigate implications which the research has on the relationships between individuals (cats and humans), the improvements of domestic cats' habitats, and the resources that are provided for them to express natural behaviours. Always, the aim should be to improve their well-being and quality of life in the short and long term.

5. RECOMMENDATIONS

The feline mind remains a mystery. Although important steps have been taken to understand it, there is a long way to go to answer questions that will help the well-being of this species and its relationship with humans. We know that cats can modify their behaviour to communicate better with us, but to what extent do they do so, and how can we respond to them? Important cognitive ability has been proven in the species, but are there cognitive differences between groups of cats (wild, feral, shelter, pet)? Further research should aim

to answer questions that contribute to our scientific understanding of how cat cognition is influenced by domestication, human bonding, and adaptation from a solitary to a social lifestyle.

There is still debate about the welfare of indoor cats versus free-roaming cats and cats allowed to leave the house freely. The arguments in favour of allowing them to leave are based on the notion of naturalness, while also concerning the mental aspect. The natural behaviour of a feline is predatory and exploratory; going out, hunting, and exploring are, among others, behaviours that the indoor cat cannot perform, which can be seen as contrary to their well-being. However, the indoor cat is not exposed to serious viral and parasitic diseases or attacks from other animals – or to getting lost, which is also part of its well-being and that of its owner. We must learn much more about the free-roaming cat and its behaviour and we must develop observations that allow us to know how the cat perceives human spaces. In this way, we will be able to better manage the spaces they share with us, allowing greater well-being of the indoor cat and providing it with the environmental and nutritional enrichment that can meet its need to go out.

Also, the findings show that cats have developed social skills that allow them to understand human emotional signals, a key factor in strengthening the human-cat bond. However, it is important to conduct studies that allow us to understand the different signals they have developed to communicate with us.

Although much remains to be understood, current literature has provided a solid basis for future research. The growing interest of the scientific community in this subject, with species-specific considerations and appropriate methodologies, will likely allow us to learn much more about cat cognition in the coming years.

Appendix C: Budget (Estimated Cost)

NICHOLAS LANE

SPANISH > ENGLISH
TRANSLATOR

40 Milne Terrace, Wellington,
New Zealand
+64 22 309 1966
nicholas.f.n.lane@gmail.com

Estimated cost of Translation

My general prices for translation of scientific/academic material are between 0.10-0.12 Euro per word. However, as I use a CAT tool utilizing translation memory, I am able to offer discounts for repetitions and similarities within the text. Therefore, the overall price should range from €700 - 1100 Euro, depending on the difficulty of the text and the required deadline. For more detailed information I have also attached my price sheet.

Yours sincerely,
Nicholas Lane

Appendix D: Invoice

Nicholas Lane

40 Milne Tce, Island Bay

6023 Wellington,

New Zealand

tel. +64 49709856

nicholas.f.n.lane@gmail.com

Invoice #

01 2022

Invoice
Date

17/05/22

Concept

Translation & Revision – Scientific/Academic

Client

Kevin Costello

NIF: B-72154386

PASEO DE

CERVANTES, 258

BARCELONA

tel. 34756998334

kevinpatrick.costello@urv.cat

Translation: es>en & Revision: en

Words

Rate
€/word

Amount

Thesis	<i>La Mente del Gato Doméstico (Felis Silvestris Catus) – Part 1</i>	4552	0.10	455.20 €
Revision	The Mind of the Domestic Cat (<i>Felis Silvestris Catus</i>) – Part 2. Seven hours at €25.00 p/hour.	N/A	N/A	175.00 €
Revision	Final revision – The Mind of the Domestic Cat (<i>Felis Silvestris Catus</i>). Two hours at €25.00 p/hour.	N/A	N/A	50.00 €

Bank Account Number: 04-34593-787224

Bank Account Name: N F N LANE

*Payment due by
31/05/2022*

TOTAL BASE

680.20 €

IVA (+21%)

142.84 €

IRPF (-15%)

102.03 €

TOTAL

721.01 €