

# **The Significance of Empirical Reports in the Field of Animal Science**

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## **ABSTRACT**

Empirical reports published in Animal Science journals have many unique features that may be reflective of the community's overarching values and goals. This report investigates the relationship between Animal Science empirical reports and the values of the Animal Science community. Two empirical reports were analyzed, and an Animal Science expert was asked to answer several questions pertaining to the significance of empirical report conventions. Our results indicated that Animal Scientists heavily value honesty and credibility, and it was concluded that they ultimately strive to expand the community's knowledge of animals.

## **INTRODUCTION**

Empirical reports are the most common form of online publication in which scientists share their experimental data and insights. All empirical reports share many distinct characteristics that distinguish them from other genres of scientific publications, including unique conventions of format, tone, style, citations, and presentation of evidence. These characteristics combined reveal a great amount about the values of the disciplines in which the empirical reports are published. One scientific discipline in particular that relies heavily on the use of empirical reports to present data is the discipline of Animal Science.

While the format and writing style of empirical reports published in online Animal Science journals is familiar to many, the implications of these conventions remain an unexplored and under-researched topic in society. In my report, the question I aim to address is: in the Animal Science community, how is information that is obtained through scientific experiments presented in online empirical reports, and what does this reveal about the discipline's values and goals? Using several genre analyses and primary data collected from an interview with a professional in the field of Animal Science, I explore in my report the significance of key empirical report characteristics.

## **BACKGROUND INFORMATION**

Animal Science is a multidisciplinary field of study that appreciates animals as an integral part of our society, economy, and culture (Animal Science Major, 2017). As animal scientists attempt to better understand the biology, behavior, nutrition, genetics, and evolution of animals, they have embraced a nearly universal method of conducting primary research; this method is more formally known as the Scientific Method. Subsequently, the Animal Science community also needed a reliable and consistent form of presenting the data they obtained through their scientific experiments. To achieve this, they adopted empirical reports as their primary form of online experimental publication.

Bruns (2007) effectively defines an empirical report as "a research article that reports the results of a study that uses data derived from actual observation or experimentation." In the case of Animal Science, scientists use empirical reports to present original experimental data on a multitude of topics encompassed by the discipline. More than often, these reports contain (at minimum) the following sections: Introduction, Methods, Results, and Discussion (Animal

Science: Sustainable Animal Husbandry: Evaluating Information, 2017). Other characteristics that appear uniformly across Animal Science empirical reports are the use of quantitative and qualitative data, different types of analyses on data, and specialized format of citation. Empirical reports, having been accepted as a reliable method of presenting data in the Animal Science community, have been refined over many decades by their constant use by scientists. Therefore, identifying these reports have become a relatively simple task; however, discussing the relationship between the reports and the scientific community is not as simple.

## **METHODS**

The majority of my primary research is derived from genre analyses on several online empirical reports published in Animal Science (or Animal Science-related) journals. I analyzed the articles to collect information on their conventions, such as the presence of Abstract, Introduction, Methods, Results, and Discussion sections. I also observed other general characteristics of the reports, such as the prominent types of data used by each article and whether similarities could be drawn between them.

In addition to analyzing the empirical reports, I reinforced my research by conducting an interview on Angelica Carrazco, who is both an expert in the field of Animal Science and my TA for course ANS2 at University of California, Davis. The following questions were asked:

1. Do scientific empirical reports in the field of Animal Science have a conventional structure? (Abstract, Introduction, etc)
2. Do empirical reports have specific guidelines for citing references?
  - a. How are they referenced? In the text, in different sections, at the Reference section?
3. Do these empirical reports adopt common conventions of language? (Passive voice, objective and concise language, unbiased, formality)
  - a. In regards to active/passive voice, objectiveness and bias of language, formality, etc.?
4. Why is it important that reports in the Animal Science discipline adhere to the same conventions?
5. What do the characteristics unique to empirical reports reveal about the values and goals of the Animal Science community?

## **RESULTS**

### **Genre Analyses**

The first empirical report article, written by Herron, M. E., Kirby-Madden, T. M., and Lord, L. K., pertains to the topic of animal behavior. Being a scientific report, the objective of the study was clearly stated: "To determine the effect of food-toy enrichment combined with cage-behavior training on desirable behaviors in shelter dogs and adoption rates." The article contains Abstract, Introduction, Methods, Results, Discussion, Conclusion, and References sections. Within the Introduction, the objective and topic of the article was established clearly, and the relevance of the research topic was discussed briefly. Secondary sources were also cited to provide pertinent information, and a hypothesis was proposed. The Methods section

provided an explanation of procedures, while the Results presented raw data in the form of visuals. The Discussion provided interpretation of the observed results and trends and discussed their significance. Finally, the Conclusion, although incorporated into the Discussion section, explained how the experimental results were significant in the field of Animal Science. Also, it acknowledged room for further research. Meanwhile, the tone of the article is straightforward and objective. Information is presented concisely and in a coherent format. In terms of citations, outside sources are referenced primarily within the Introduction and Discussion sections of the article, and all references used are included in a separate “References” section at the end of the article. 19 sources were referenced. It is useful to note that Herron et al. referenced outside authors but did not exchange ideas with them nor discuss their implications. Rather, secondary sources in their empirical report were used simply to strengthen the context of the research or to provide relevant background information. The evidence collected to support their findings were primarily quantitative; several numerical charts were utilized. Ultimately, Herron et al. stated their conclusion explicitly that “enrichment programs improve desirable behaviors and decrease undesirable behaviors in shelter dogs.”

The second empirical report article also pertains to the Animal Sciences but corresponds to the topic of animal genetics. The authors of this scientific study are Wangdee, C., Leegwater, P.A., Heuven, H. C., van Steenbeek, F. G., Techakumphu, M., and Hazewinkel, H. A. In this primary research experiment, the objective was also clearly stated: “to investigate the prevalence of PL in a cohort of Thai Pomeranians and to estimate its heritability.” This article contains an identical format to the first article, as it includes Abstract, Introduction, Methods, Results, Discussion, Conclusion, and References sections. All of these sections performed the same function as they did in Herron et al.’s article, except that a hypothesis was not presented in Wangdee et al.’s article. The tone of this article is straightforward and direct. Sources were cited exactly as they were in Herron et al. Once again, results of their experiment were predominantly quantitative and supplemented with statistical charts. 28 sources were referenced. The conclusion of their report was that “the heritability of PL in this population was 0.44...”

**SMALL ANIMALS**

Twelve dogs were removed for illness (n = 4), wearing an Elizabethan collar (which would interfere with enrichment, 3), do-not-feed designation as a result of recent dental procedures (2), deafness (1), shy dog program participant (additional enrichment provided by shelter staff, 1), and having been returned to shelter (1), leaving 107 dogs for adoption rate analysis. Median age, body weight, sex, breed (mixed vs purebred), and source (stray, owner-surrender, or impounded) were not significantly different between the experimental and control groups (Table 1). There was no significant difference in the mean duration of stay until adoption between the dogs in the experimental and control groups. The mean duration of stay for dogs in the experimental group was 4 days, compared with the control group at 3.75 days. Thirty-nine of 59 (66%) control dogs and 34 of 48 (71%) treatment dogs were adopted by day 7; survival analysis revealed no significant difference in adoption rates between groups.

**Behavioral observations**—Sixty dogs were enrolled in the study long enough to have behavioral observations recorded at day 3, including 26 dogs in the experimental group and 32 dogs in the control group. Of the 2 dogs remaining, one was missing from its cage for > 4 of 6 behavioral observations and another was missing day 3 observation data. Both dogs were therefore excluded from analysis, leaving 58 dogs for behavioral observation analysis. Remaining experimental and control subjects had no significant difference in group composition (age, body weight, sex, breed, or source; Table 2).

The increase from day 0 to 3 in the percentage of dogs with various desirable behaviors was significantly greater for dogs in the group that received the enrichment protocol, compared with dogs that did not receive the enrichment protocol. From day 0 to 3, dogs in the experimental group had a significantly (P = 0.001) greater increase in either sitting or lying down body postures (as opposed to standing, walking, or jumping), compared with dogs in the control group (17/26 [65%] vs 7/32 [22%], respectively). Similarly, dogs in the experimental group had a significantly (P = 0.045) greater increase in quiet behavior, compared with control dogs (9/26 [35%] vs 4/32 [13%], respectively). No significant change in the percentage of dogs with the desirable behaviors of a front-of-cage position, reduced fearfulness, or making eye contact was found between experimental dogs and control dogs, yet these desirable behaviors were uniformly high in both groups on both days (Table 3).

The decrease in the percentage of dogs with the undesirable behavior of tumbling from day 0 to 3 was sig-

nificantly greater for dogs in the experimental group than in the control group (17/26 [65%] vs 7/32 [22%], respectively).

Signalment	Experimental (n = 48)	Control (n = 59)
Age (y)	1.4 (0.5–6)	2 (0.5–6)
Sex		
Male	23 (48)	36 (59)
Female	25 (52)	23 (41)
Body weight (kg)	15 (2.5–38)	12.3 (2–36)
Breed		
Purebred	23	24
Mixed	25	35
Source		
Impound	20	21
Stray	10	14
Owner surrender	18	24

Data are median (range) or number (percentage). All males were castrated and all females ovariohysterectomized prior to being placed up for adoption.

Table 2—Signalment of dogs in the control and experimental groups in Table 1 that were available for behavioral observations after 3 days.

Signalment	Experimental (n = 26)	Control (n = 32)
Age (y)	2.2 (0.5–6)	2.3 (0.5–6)
Sex		
Male	17 (65)	20 (63)
Female	9 (35)	12 (37)
Body weight (kg)	17 (3–35)	15 (3–52)
Breed		
Purebred	12	12
Mixed	14	20
Source		
Impound	11	14
Stray	5	5
Owner surrender	10	13

Table 3—Total number (%) of selected desirable behaviors with uniformly high prevalence across group and time. The number of times the behavior was observed is reported as a percentage of total number of observations.

Variable	No. of trials	Front of cage	Eye contact	Not fearful
Control				
Day 0	192	183 (95)	177 (92)	143 (74)
Day 3	190	190 (100)	177 (93)	164 (86)
Experimental				
Day 0	154	147 (95)	140 (91)	122 (79)
Day 3	150	147 (98)	144 (96)	139 (93)

Data are number (percentage).

dogs had a significantly (P < 0.020) greater increase in barking, whimpering, or growling, compared with the

Figure 1: Depicts the quantitative data used in Herron et al.'s article as well as the conventional format and tone of the report.

### **Interview**

The following transcript is taken from the interview with A. Carrazco.

1. "Empirical reports in Animal Science usually have the same basic... 5 or 6 sections. The sections are Abstract, Introduction, Methods, Results, Discussion, Conclusion, and References. Some reports have variations of this structure, such as subheadings within these sections. But they're always listed in that order."
2. "They always contain a section where all the references are listed in a specific academic format, and sources are also cited throughout the paper - usually in the Introduction and Discussion and Conclusion depending on who writes the paper. They're usually just mentioned briefly to provide some sort of background or summary of previous research."
3. "[...] So all animal scientists talk passively in their reports for the sake of credibility and professionalism. They're usually really direct in their writing and they try to be as least bias as possible."
4. "It reveals that Animal Scientists put credible information above all else, and that they want to share truth and knowledge on animals."

### **DISCUSSION**

As demonstrated by our two genre analyses and the interview responses, empirical reports in the field of Animal Science are characterized by unique formatting and structure. Abstract, Introduction, Methods, Results, Discussion, Conclusion, and References sections are integral parts of these reports that provide an essential outline to the papers. More importantly, our results indicate that the information contained within each of these sections serves specialized functions that are unique to Animal Science reports; this is demonstrated in the Abstract sections of both empirical reports used for this study. The Abstract in Herron et al.'s article highlights the objective of their study and its relevance, but the greatest emphasis is placed in explaining how their study aids in the community's understanding of animals. Similarly, the Abstract in Wangdee et al.'s article declares the article's contribution to the study of animals. Another notable feature shared between the two articles is the minimal mention and discussion of the authors' hypotheses. In fact, Wangdee et al. did not provide an initial hypothesis at all. Instead, the authors of both articles talk more about the implications of their data for the Animal Science community.

Both articles used for analysis incorporated a substantial number of references. Herron et al. referenced 19 sources, while Wangdee et al. referenced 28 sources. Clearly, referring to the findings of other individuals is just as important to animal scientists as is conducting original primary research. However, the manner in which sources were referenced within the text of the empirical reports differs from conventional referencing guidelines. Linton (1994) suggests that this manner is unique to empirical reports, and that "selecting references effectively and incorporating them in the right places is more important than discussing them" in empirical reports. Possible reasoning behind this is that scientists try to refrain from interpreting the results of other primary research experiments as this would create more personal bias in their

own reports, thus diminishing the credibility of their own research. If this reason is the truth, then it would align with one of the fundamental objectives of the Animal Science community that A. Carrasco highlights: to present data on animals truthfully and with as little bias as possible.

My results also indicate that the tone of empirical reports published in the field of animal science is intended to be straightforward and objective. Language is used more as a medium where information and data can be conveyed transparently as opposed to other genres which employ considerable use of opinions and personal insights. Within the category of language, expressing disagreement is yet another aspect of genres that distinguish them from each other. The empirical reports studied in this report express disagreement indirectly; evidence that falsifies the findings of previous studies is expressed objectively rather than in active response to those previous studies. This is ultimately because the purpose of publishing evidence in Animal Science empirical reports is to provide factual and unbiased information in efforts to advance knowledge in the particular field of study, rather than to impugn the findings of others or to otherwise discredit others. Information must be shared objectively so that the raw data can also be interpreted by other members of the community who may desire to replicate the experiment.

The findings of my primary research elucidate that the primary type of evidence that is accepted and used by the Animal Science community is concrete quantitative measurement. Quantitative measurement is the most explicit and unambiguous form of evidence because statistical proof is difficult to refute. Of course, qualitative measurements are also a major part of scientific data collections. Such measurements include written descriptions, such as descriptions on the behavior of animals in a given study. It is difficult to present a convincing argument solely on the basis of qualitative measurements because qualitative measurements can easily be interpreted differently and thus reflect a degree of subjective bias (Bradford, 2015). Mathematics, on the other hand, is a universal language. It is for this reason that nearly all Animal Science experimental reports contain some sort of statistical presentation of evidence.

## **CONCLUSION**

Our two genre analyses, along with the responses from our interview with A. Carrasco, indicate that members in the field of Animal Science aim to present their information as professionally, truthfully, and explicitly as possible through empirical reports. They achieve this by conforming to common standards of format, reference style, language and diction, and evidence usage.

Moreover, we noticed that Animal Scientists offer significantly less personal input in their empirical reports than do scientists of other disciplines. They dedicate large portions of their papers to discussing the significance of their results in the context of Animal Science, revealing that the Animal Science community values the pursuit of shared knowledge over the pursuit of fame and recognition.

Maintaining truthfulness by presenting their data objectively and without personal input only makes it easier for Animal Scientists to be proven wrong, but this ultimately reinforces the selfless values of the community. Whether the conclusions that animal scientists derive from their evidence is true, false, or partially true, the information that they share is invaluable

material to other animal scientists in the community. They accept the fact that their evidence, so long as it is presented in accordance to existing conventions and expectations, contributes to a larger pool of knowledge that is built on decades of scientific integrity and consistency.

In the end, Animal Scientists are invested in a cause greater than themselves individually. A. Carrasco indicates that this commitment to something other than themselves reveals their intentions of sharing truth and knowledge on animals. Therefore, the goal of the Animal Science community as a whole is to further the community's knowledge and understanding of animals.

## REFERENCES

- Animal Science Major. (2017). *UC Davis*. Retrieved from <https://www.ucdavis.edu/majors/animal-science/>
- Animal Science: Sustainable Animal Husbandry: Evaluating Information. (2017). *Cornell University Library*. Retrieved from <http://guides.library.cornell.edu/c.php?g=642402&p=4503957>
- Bradford, A. (2015). Empirical Evidence: A Definition. *Live Science*. Retrieved from <https://www.livescience.com/21456-empirical-evidence-a-definition.html>
- Bruns, C. (2007). Empirical Research: How to Recognize and Locate. *Cal State Fullerton Pollak Library*. Retrieved from [http://users.library.fullerton.edu/cbruns/empirical\\_research.htm](http://users.library.fullerton.edu/cbruns/empirical_research.htm)
- Linton, P., Madigan, R., Johnson, S. (1994). Introducing Students to Disciplinary Genres: The Role of the General Composition Course. *Language and Learning Across the Disciplines, Volume 1(2)*.

## APPENDIX

- Herron, M. E., Kirby-Madden, T. M., Lord, L. K. (2014). Effects of environmental enrichment on the behavior of shelter dogs. *Journal of the American Veterinary Medical Association, 244, 687-692*.
- Wangdee, C., Leegwater, P. A., Heuven, H. C., van Steenbeek, F. G., Techakumphu, M., Hazewinkel, H. A. (2017). Population genetic analysis and genome-wide association study of patellar luxation in a Thai population of Pomeranian dogs. *Journal of Research in Veterinary Science, 111, 9-13*.