Anatomy of Trust: An overview of Ripeta's approach to trust in science

"If science accumulates truths, it does so on a rational basis, not through luck, thereby justifying the universal obtainability of its results. However, the universality of science appears to be measured in terms of the trust we place in science." (Nnaji, 2013)

Over the last decade, there has been a growing focus regarding the integrity of scientific research. The advent of the COVID-19 pandemic in 2020 has amplified the need to find, check, share, and reuse data at a faster pace than ever before. At Ripeta, we believe that ***open* science must support *good* science.** This outbreak has heightened the importance of transparently sharing data, analysis methods, software, and code, and it has also highlighted the importance of *rapidly checking* research.

An inherent mysticism permeates science, yet trusting in science means trusting in something that you cannot always see. The owner of an electric coffee maker may not understand how all of the parts come together to form a moving, functioning, device, but they trust that they will have a hot cup of coffee every morning. (To all our Italian readers who *do* understand how to make the perfect caffè and the mechanics of electric coffee makers, please forgive us.)

In this post we will explain some of the major reasons why distrust in science has grown and how we -- as Ripeta and as a scientific community -- can work to build a more transparent way of communicating and partaking in science.

Trust (and *dis*trust) in science today

The scientific method offers a systematic methodology for scientists to test research questions and present results. Modern science, with the addition of scholarly publishing, allows for more questioning, retesting, confirming, and review. The research and review process is built to *hopefully* produce a reliable result for which future scientists can build upon.

Yet, this same academic environment that has yielded numerous advances has also engendered research that is vulnerable to misinterpretation, human error, and flawed methodology -- all of which lead to popular distrust. Perhaps more concerning are instances of retracted research, predatory journals, paper mills, made-up or misrepresented authors, fake news, and more. These potentially nefarious practices threaten the reliability of research on the whole, and put into question many of the sources we rely on. This is why Ripeta's mission is crucial in the fight for public understanding of science, and quality of scientific information sharing.

For more information on public trust in science today, check out these studies done by Pew Research Center and this article from the Proceedings of the National Academy of Sciences (NAS).

How we determine trust at Ripeta

Ripeta is dedicated to building trust in science by making science faster, open, transparent, and reproducible, *and* checked. When we assess a manuscript for trustworthiness, we break down trust in science into three groups: Research, Professionalism, and Reproducibility. Each of these groups are composed of indicators determining the trustworthiness of a manuscript. These categories represent multiple quality indicators one may find in a research paper. It is important to note here that the inclusion of these indicators in a paper does not ensure trustworthiness, it merely suggests that the writer is implementing necessary markers of trust.

Note: we are only listing some of the quality indicators for each category. We encourage you to think about your own experience with research, and what else you might look for in a 'trustworthy' source.

Trust in the Reproducibility

Reproducibility is the DNA of a manuscript. With the proper 'genetic material' to work with, future researchers can build upon the previous findings, and subsequently expand the discourse.

The indicators in this category support the *potential* for research reported in an individual paper to be reproducible. While reproducible research presents many challenges in practice, reporting the research transparently bolsters trust and improves the chances for future citations.
Indicators of Trust in Reproducibility include:

- Data Availability Statement (DAS)
- Data Sharing Locations
- Code Availability Statement
- Code Sharing

Trust in the Professionalism

Professionalism is the heart of the study. It is what keeps the study alive through passion, funding, support, and resources. Professionalism refers to the authorship of a paper and the legitimacy of the individual or institution that performed the study. At Ripeta, we examine Trust in Professionalism using a multi-layered approach.

First, we determine if the author is in fact a scientist (i.e., not an imposter or impersonating of a scientist). If the author passes the first check, we determine if they are reporting indicators expected within professional research and we verify previously published works.

Indicators of Trust in Professionalism include:

- Ethical Approval Statement
- Funding Statement
- Conflict of Interest Statement
- Low self-citation
- Verified author

Trust in the Research

Research is the skeleton of scientific trust, and if it is lacking then there is a fundamental problem with the paper that cannot be easily fixed - *if* it is supposed to be research, of course. Other forms of scientific communication occur through editorials, commentaries, and the like. However, *research* - quantitative and qualitative - is where we derive much of the critical scientific knowledge we use today.

Trust in research is derived from an author following established protocols within the scientific method. And this differs from other writings such as commentaries. While commentaries typically provide scientific experts summaries of a topic, they do not provide the scientific rigour of research.

Example that, when included, indicates Trust in Research:

- Study Objective
- Presences of certain sections (e.g. Methods, Results, Bibliography)

Fostering Trust in Science

Ripeta positions indicators of trust into three categories: Reproducibility, professionalism, and research. Each of these categories are needed to create a piece of research that promotes trust and transparency.

Let's look at an example of a pseudo research article containing all necessary indicators of trust. Each indicator will be followed by the specific components within the paper.

Trust in Reproducibility - Can this paper be replicated for future research?

Look for... Code Availability Statement, Data Availability Statement (DAS), Data Locations

- Includes data availability statement and links to the data used.
- Detailed methods section laid out in the abstract.

Trust in Professionalism - Are the actors behind the study reliable?

Look for... Ethical Approval Statement, Funding Statement, Section Headings Information

- More than one author, and all are verified through institution and previous works.
- Includes a funding statement and all pertaining information.
- Contains an ethics statement.

Trust in Research - Is this actual research?

Look for... Study Objective

- The study objective is clearly stated.
- Detailed Methods and Results sections.

Abstract
Background
Materials and Methods
Results
Discussion
Conclusions
Additional files
Figures (2)
Authors' contributions
Authors' information
Ethics approval statement
Funding statement
Footnotes
Citations
Data
Code
Additional

Ventilatory Defects in Orc Raiders Exposed to Industrial Fumes.

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Library of the Black Gate. *Mordor Journal of Public Health*. April 7, 2997 88(6)
Citation information

Abstract

Background

Mordor has a woefully small body of literature[1] about what affects the smog near the Black Gate has on young orcs and their lung development. We will follow two cohorts of 100 orcs born near the black gate between 2993-2994 and follow their early lives. Our objective is to determine whether exposure to extreme air pollution or soon after birth affects lung health development as orcs reach fighting age.

Materials and Methods

Of the two cohorts, one cohort (A) will be immersed in black smog for 6 hours each morning and 6 hours each night. The other cohort (B) will have no extra smog introduced to their lives and will be relocated further away from the industrial forges and giant piles of burning garbage. They will be screened quarterly for markers of lung dysfunction including a VO2 Max Test, inspiratory and expiratory volume measurements, and randomized dissection to check for lung tumors.

Measurements and Main Results

Prevalence of lung tumors during child- hood and conscription age is analyzed for 40 subjects, 20 from each cohort. Exposure to the smog in the first year of life increases the likelihood of early onset lung dysfunction by 300% (95% confidence interval [CI], 240%–360%). We found evidence suggesting that the exposure to excessive amounts of smog decreases the VO2 Max, and thus military viability, of conscription age subjects by an average of 24mL/kg/min (95% confidence interval [CI], 18mL/kg/min – 30mL/kg/min). Our testing also supported the hypothesis that total tidal volume is decreased when subjects grew and developed with high amounts of smog around them. The exposure to excessive amounts of smog decreased subjects' total tidal volume by an average of 0.5L (95% confidence interval [CI], 0.07L–0.93L).

Conclusions

When factoring in the economic benefits of breeding orcs near the industrial forges, black pit, and scrap metal repurposing center it seems ill advised to move orcs away from toxic levels of smog despite the marked lung health benefits. Instead, we suggest

[1] Ghoggedh, Udborg, et al., Meta-analysis of existing research on health effects of Mordor's post industrial-revolution climate, Mordor Journal of Public Health, 2989