

Meta-analysis of Preclinical Rodent Chronic Pain Studies: A Systematic Study Identifying Trends and Inconsistencies of Language, Methodology, Biases, and Models Utilized Within the Field

Sarah A. D'Angelo, Nathan T. Fried, PhD

Background- Chronic Pain Quick Facts



Chronic pain outnumbers heart disease, cancer, and diabetes **combined**.³



\$560- \$635 billion costs associated with chronic pain patients annually²

#1 human health problem worldwide in terms of **prevalence, disability and economic burden**¹

Only **2%** of pain therapeutics ---- as opposed to the **10% of other condition's** ---- confirmed to **work in rodents** reach approval for human use.¹



Hypothesis

External validity can potentially be increased if researchers have access to a **more robust standard of objective working definitions of pain and its measurements in rodent studies.**

Objectives

Provide insight into the causes of the translational gap for pain therapeutics by improving the use of rodents in pain research.

Identify the discrepancies, inconsistencies, biases, and thus the various problems that hinder the neuroscience of chronic pain research from progressing forward.

Pilot Results

Reporting Of Rodent Sex

*While reporting of genders has improved, the bias towards only using male rodents persists

50%
Males



17%
Females



33%
Both



Reporting Of Rodent Weight



Did Not Report Rodent Weights

*Weight is known to be an indicator of rodent age and health

Reporting Of Rodent Age

Pain Behavior Studies: Reporting Of Rodent Ages

35%

Did Not Report Age In Weeks

48%

Did Not Report Age In Any Way

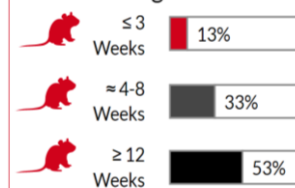
41%

Total Rodents Labeled As "Adults"

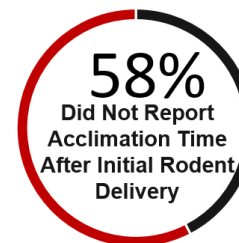
45%

Labeled As Adults, Did Not Report Age In Weeks

Rodents Labeled As "Adults" Had Wide Variability In Their Actual Age In Weeks



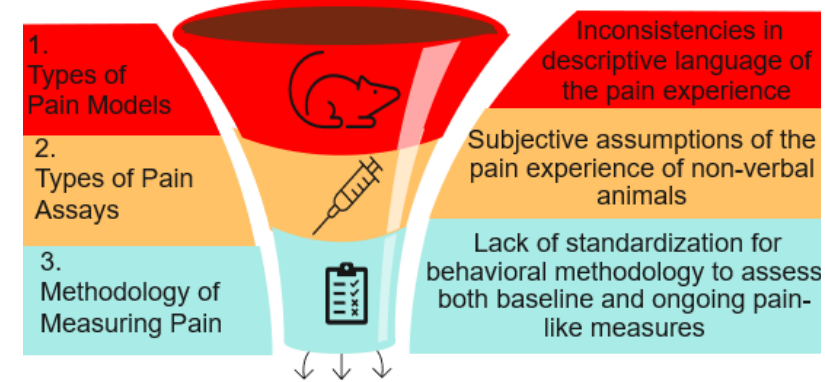
Reporting Of Rodent Acclimation Time



Methods

A systematic review of published studies to the journal *PAIN* 2019 was conducted, yielding 80 studies, with 66 total studies meeting the inclusion criteria.

Meta-analysis thus far showed a plethora of discrepancies in the way preclinical pain rodent studies are being conducted and reported:



Existing Translational Crisis in Preclinical Pain Research

Discussion

- The wide variability in preclinical approaches to using rodent subjects as models for human pain may contribute to the disparity between preclinical and clinical pain research.

Future Directions

- This pilot study represents the beginning of expanding the evaluation beyond the journal *PAIN* to the scientific journals *PAIN*; *Jneuro*; *Cell*; *Nature*; and *Science*, for each year.

References & Acknowledgments

- Mogil JS. Qualitative sex differences in pain processing: emerging evidence of a biased literature. *Nature reviews Neuroscience*. 2020;21(7):353-365. doi:10.1038/s41583-020-0310-6
- Gaskin DJ, Richard P. The Economic Costs of Pain in the United States. *The Journal of Pain*. 2012;13(8):715-724. doi:10.1016/j.jpain.2012.03.009
- Institute of Medicine. (2011). *Relieving Pain in America Report 2011*. Armst. C., Licking, E., & Barrett, A. (1999). *Conquering pain: New discoveries and treatments offer hope*. *Business Week*, 3618, 102-106.
- Figures created using Biorender.com & Piktochart.com
- Rutgers Camden MARC U STAR - T34 GM127154