Summer 2014

Assessing Empathy in Rats: The Role of Shared Experience

Dylan Richmond
drichmond@pugetsound.edu

Assessing Empathy in Rats: The Role of Shared Experience

Dylan Richmond & Dr. Erin Colbert-White
Department of Psychology, The University of Puget Sound, Tacoma, WA

INTRODUCTION

Empathy and Nonhuman Animals

Empathy is when an observer's understanding of an individual's affective state causes that observer to experience the same affective state.

Understanding whether nonhuman animals experience emotions in a similar way to humans is valuable for animal research and ethical reasons.

Empathy or empathy-like behavior has been concluded by researchers studying a variety of social mammals (e.g., apes, Jensen et al., 2006; elephants, Byrne et al., 2008; dogs, Custance & Mayer, 2012)

Ben-Ami Bartal et al. (2011) found that rats freed their cagemates from a restraint tube, and concluded rats also have empathy. This garnered two main criticisms:

1. Freeing behavior could be explained by the donor's desire for social contact, NOT empathy (Silberberg et al., 2014)

2. There was no evidence of "goal-directed" behavior by the donors to free their cagemate (Vasconcelos et al., 2012)

The Current Study

To address the above criticisms, we used Ben-Ami Bartal et al.'s (2011) model with two modifications:

1. An adjacent chamber to separate donors and freed rats.

2. An intervention designed to demonstrate "goal-directed behavior."

Hypotheses

Compared to Non-Intervention donors, Intervention donors will:

- Free their cagemates at higher rates
- Spend more time in the restraint tube

METHOD

Subjects

- 26 pair-housed female Long-Evans rats (*Rattus norvegicus*)
- Matched based on temperament and dominance data to Intervention or Non-Intervention conditions as well as two replication groups

Apparatus

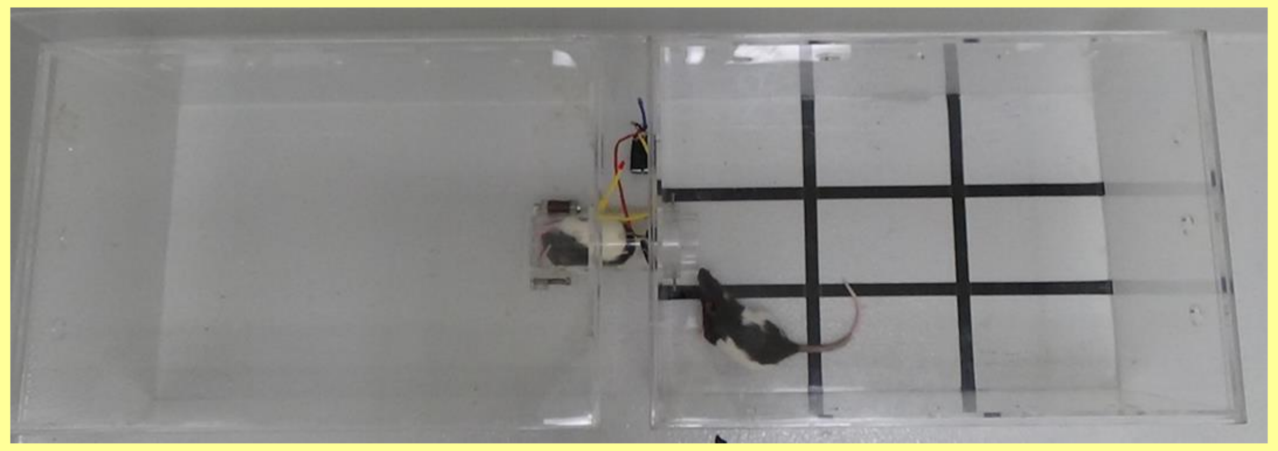
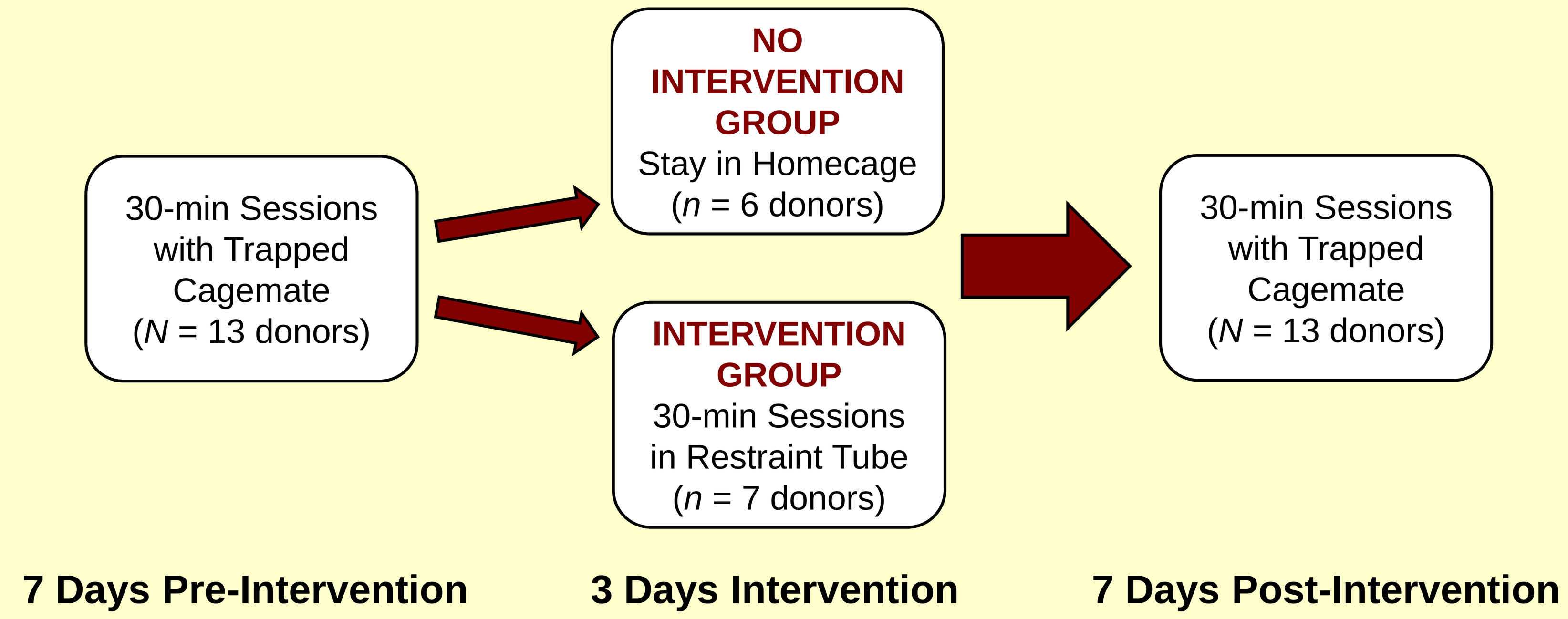


Figure 1. Two enclosures connected by a restraint tube. Donors (right enclosure) pressed a sensor within the tube to open a door, thus freeing their cagemate into the left enclosure. The door was powered by a small battery pack. Donors were separated from their cagemates at all times and were unable to cross through the tube.

EXPERIMENTAL DESIGN



One week elapsed between the finish of the first replication group and the start of the second. All sessions were video taped and scored using 15-sec time sampling for donor's location (see Figure 1 grid floor), behavior (e.g., climbing, rooting), sensor presses, and time spent in the tube.

RESULTS

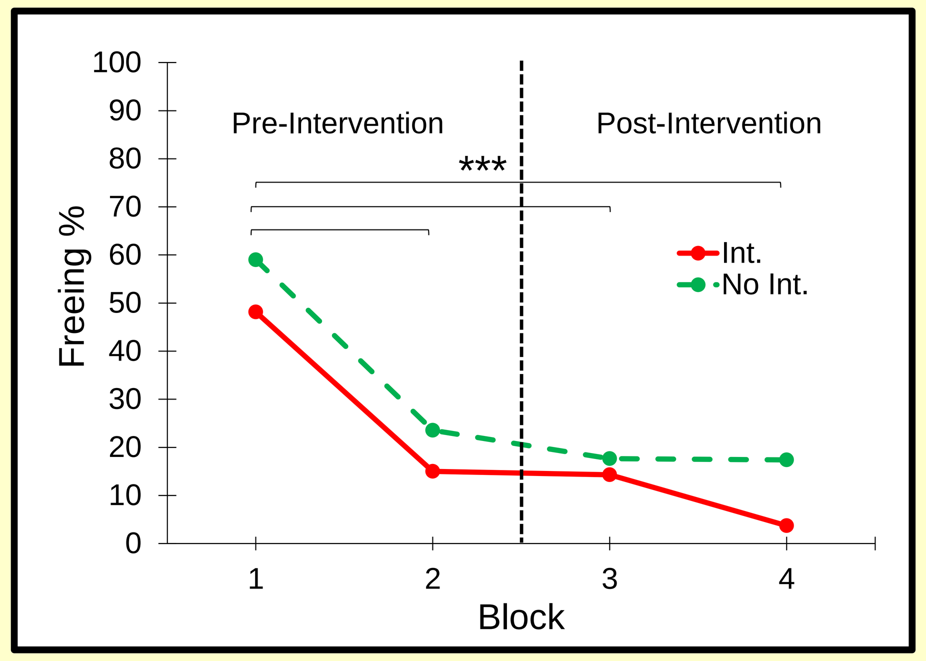


Figure 2. Total percent of donors who freed across four 3-session blocks. **There were no statistical differences between the Intervention and Non-Intervention donors for any blocks** (chi-square, all *ps* > .05). **However, Intervention and Non-Intervention donors freed cagemates significantly more often during Block 1 sessions compared to all other blocks** (chi-square, all *ps* <.001).

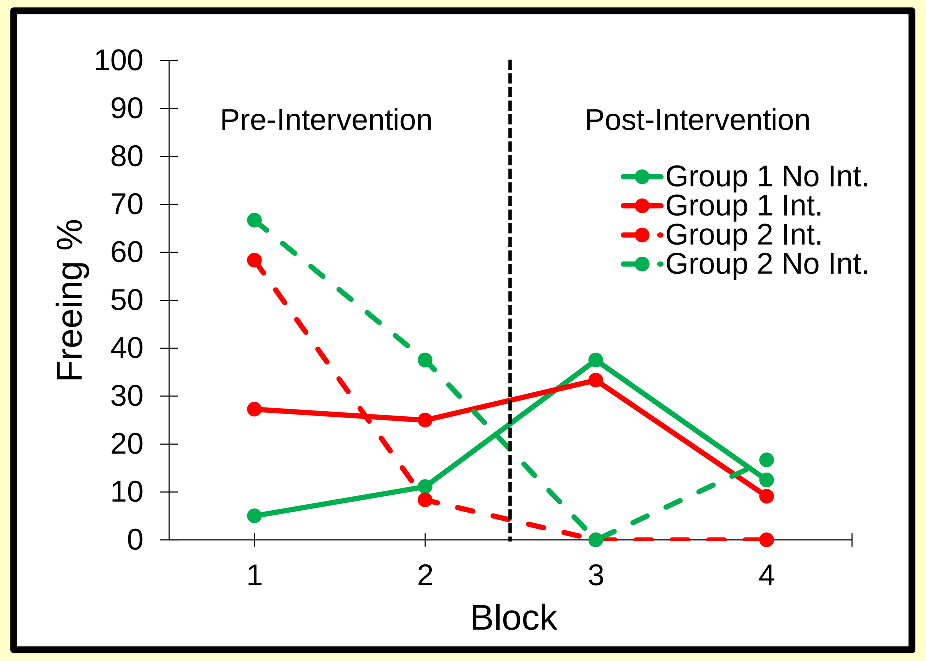


Figure 3. Total percent of donors who freed across four 3-session blocks broken down by first and second replication groups. **The older (i.e., physically larger) replication group (Group 2) appeared to free cagemates less often than Group 1 immediately following the intervention** (small *ns* precluded statistical analysis).

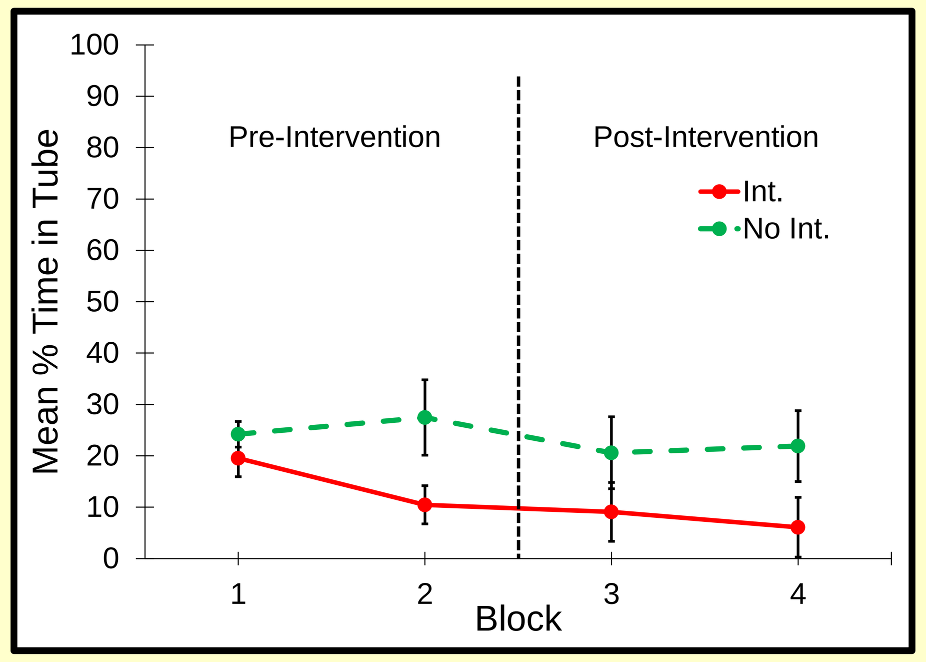


Figure 4. Mean percent of time donors spent in the restraint tube across four 3-session blocks. **There were no statistically significant differences between the Intervention and Non-Intervention groups for any blocks** (2-way mixed ANOVA, all *ps* > .05).

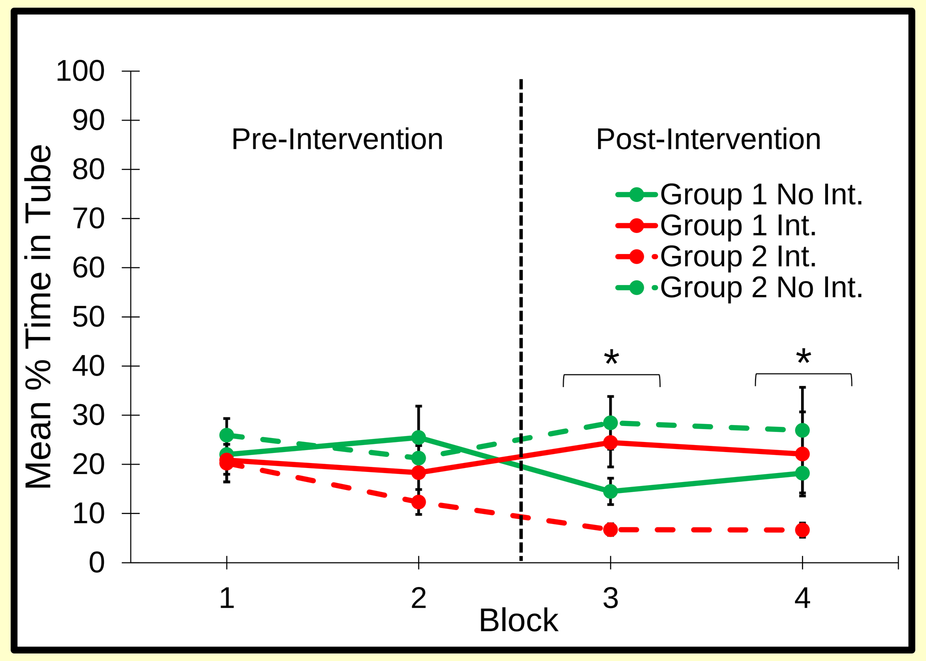


Figure 5. Mean percent of time donors spent in the restraint tube across four 3-session blocks broken down by first and second replication groups. **Following the intervention, Group 2 donors in the Intervention condition spent significantly less time in the tube than both Non-Intervention groups** (2-way mixed ANOVA, all *ps* < .05).

CONCLUSIONS

- As donors matured, being trapped inside the tube became a more aversive experience, leading to significantly lower freeing behavior and time spent in the tube post-intervention. This suggests a shared experience may not be enough to solicit empathetic freeing behavior if the experience is too aversive.

- Decreased freeing behavior from Block 1 onward could be attributed to aversive qualities of the sensor. When pressed, the sensor sparked and heated up. This was not intended.

- Aversive qualities of the sensor may have prevented the donors from learning that pressing it released their cagemates. Thus, rats may have empathy, but our experiment was unable to accurately assess it.

- Methodological replication with fully-matured rats and a computerized sensor is warranted to better test for empathy in rats.

REFERENCES

- Bates, L. A., Lee, P. C., Njiraini, N., Poole, J. H., Sayialel, K., Sayialel, S., ... & Byrne, R. W. (2008). Do elephants show empathy? *Journal of Consciousness Studies*, *15*(10-11), 10-11.
- Ben-Ami Bartal, I., Decety, J., & Mason, P. (2011). Empathy and pro-social behavior in rats. *Science*, *334*(6061), 1427-1430.
- Custance, D., & Mayer, J. (2012). Empathic-like responding by domestic dogs (*Canis familiaris*) to distress in humans: An exploratory study. *Animal Cognition*,*15*(5), 851-859.
- Jensen, K., Hare, B., Call, J., & Tomasello, M. (2006). What's in it for me? Self-regard precludes altruism and spite in chimpanzees. *Proceedings of the Royal Society B: Biological Sciences*, *273*(1589), 1013-1021.
- Silberberg, A., Allouch, C., Sandfort, S., Kearns, D., Karpel, H., & Slotnick, B. (2014). Desire for social contact, not empathy, may explain "rescue" behavior in rats. *Animal Cognition*, *17*(3), 609-618.
- Vasconcelos, M., Hollis, K., Nowbahari, E., & Kacelnik, A. (2012). Pro-sociality without empathy. *Biology Letter*, *8*, 910-912.

ACKNOWLEDGEMENTS

This project was graciously funded by a University of Puget Sound AHSS Summer Research grant, the Richard Bangs Collier interdisciplinary award, a University of Puget Sound UEC research grant, and a grant from the University of Puget Sound Psychology Department.

We thank Bob Peaslee, the University's science support engineer, for building the restraint tubes and enclosures.

We also thank Allison Winzenreid, Jen Onaga, and Kevin Kates for their help with temperament data collection and video coding.