

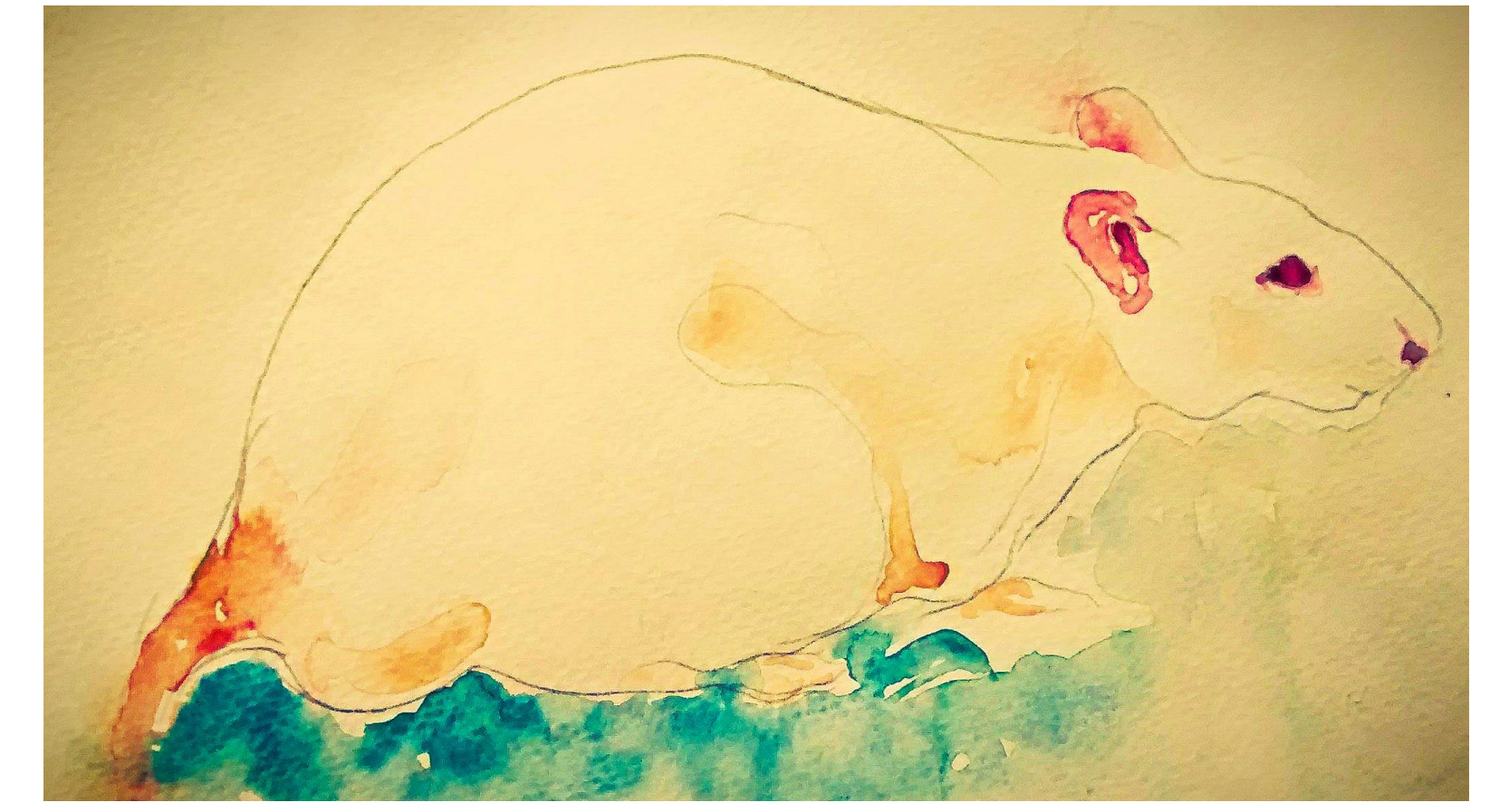


# Understanding variation in rat responses to CO<sub>2</sub>

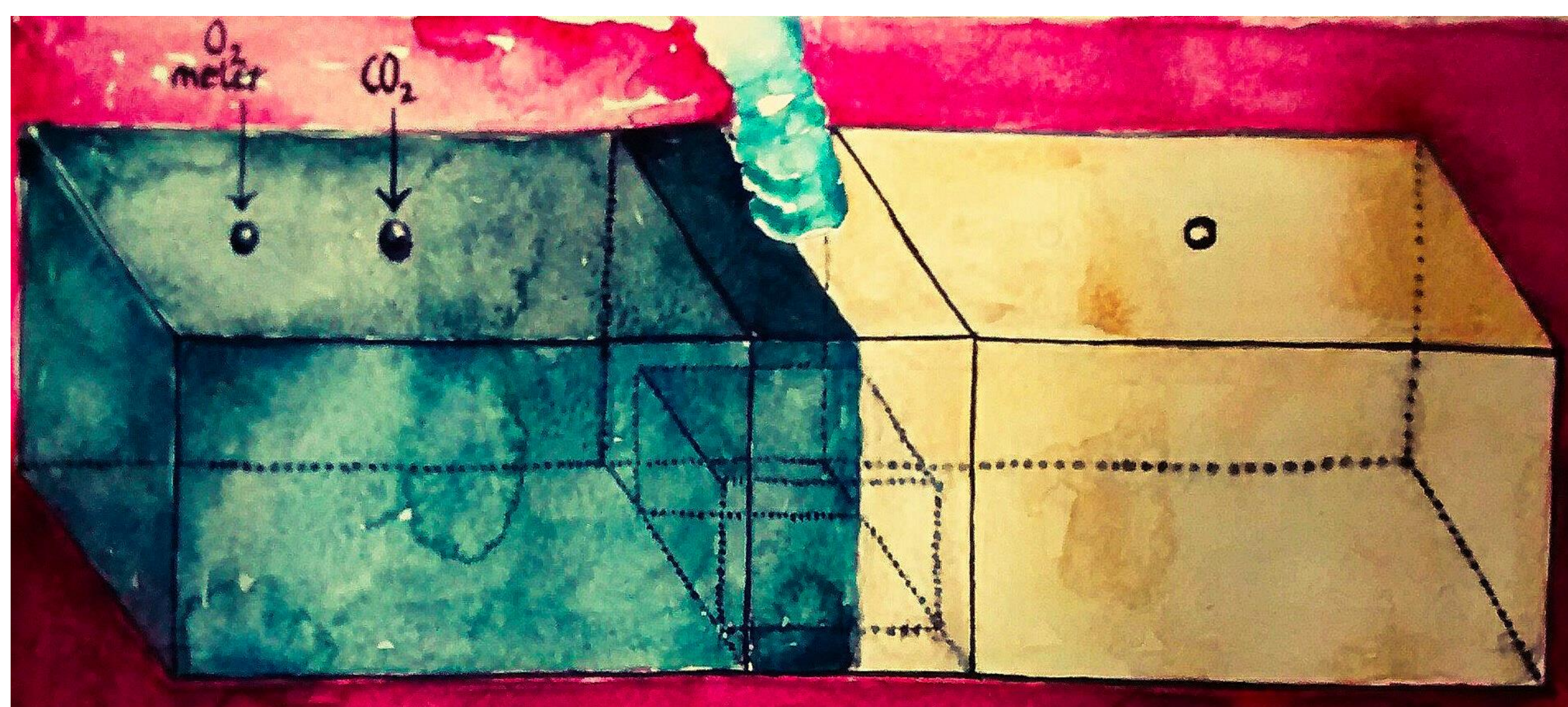
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## Introduction

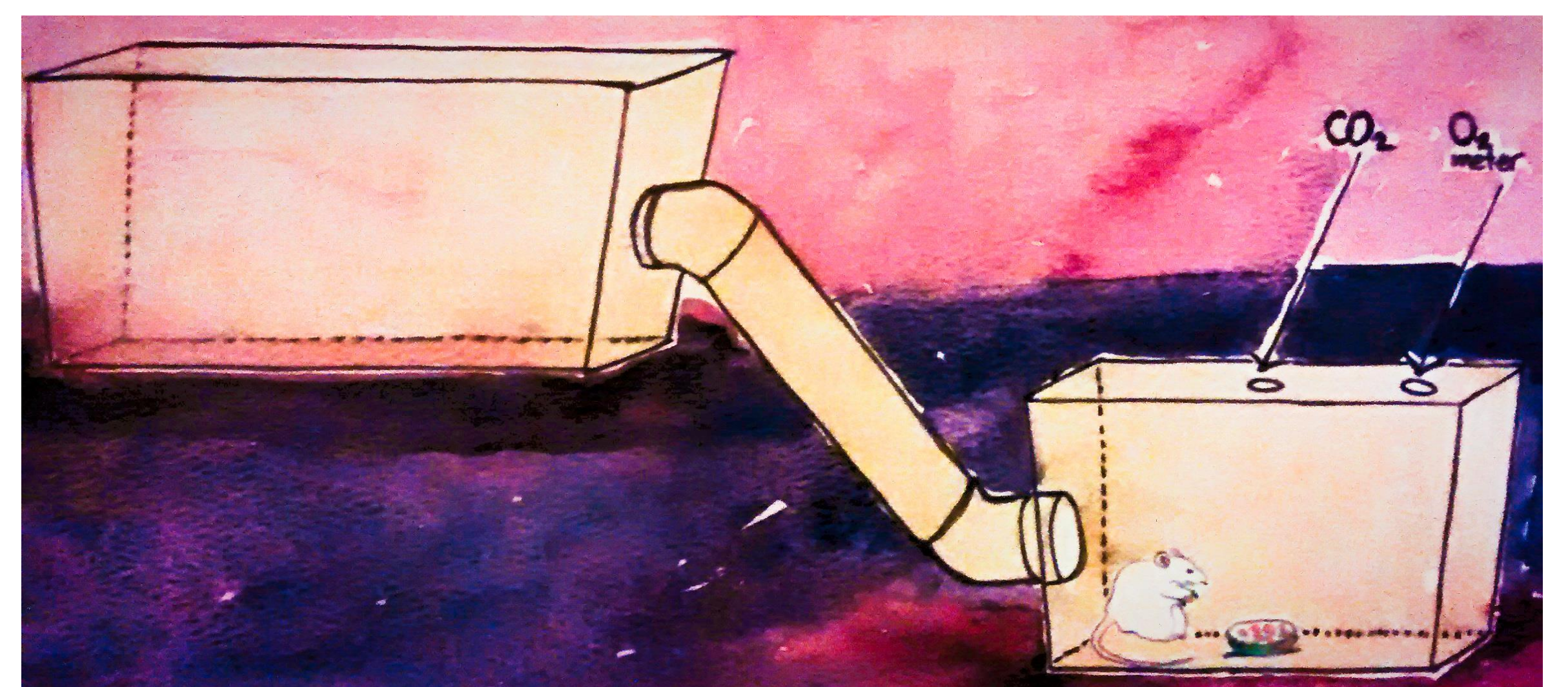
Carbon dioxide (CO<sub>2</sub>) euthanasia is controversial because the agent is aversive. The way rats respond to CO<sub>2</sub> is variable<sup>1</sup>, perhaps indicating that the agent is innocuous to at least the low responders. **The aim of this study was to better understand individual variation in behavioural responses to CO<sub>2</sub>, by comparing the individual strength of aversion within and between aversion-avoidance and approach-avoidance tests.**



## Methods

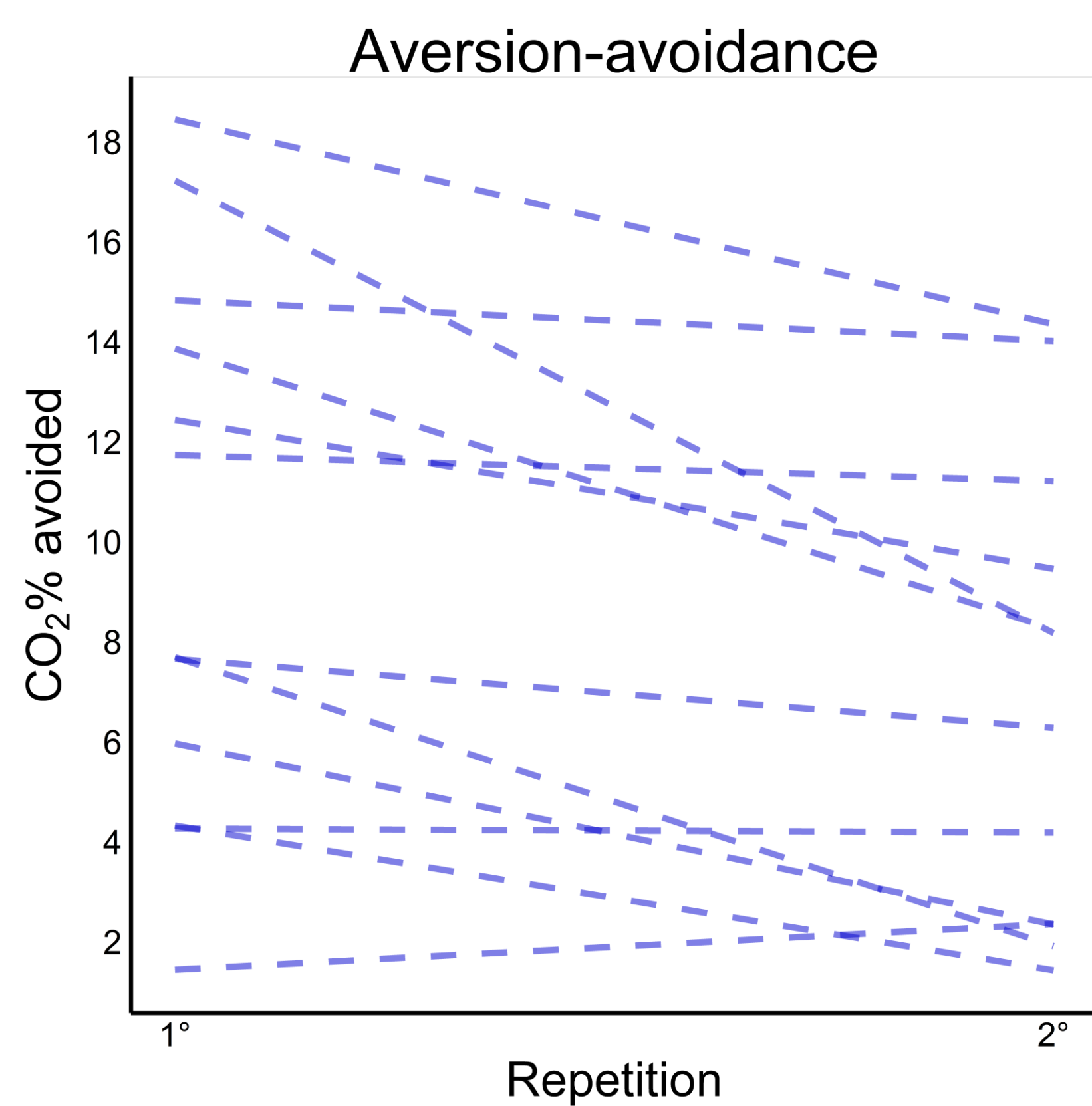


In aversion-avoidance tests (2 repetitions/rat) rats could either stay in the preferred dark side of the cage but with exposure to CO<sub>2</sub> gradual fill (18% volume min<sup>-1</sup>) or escape to the brightly lit (1650 lux) side of the cage.

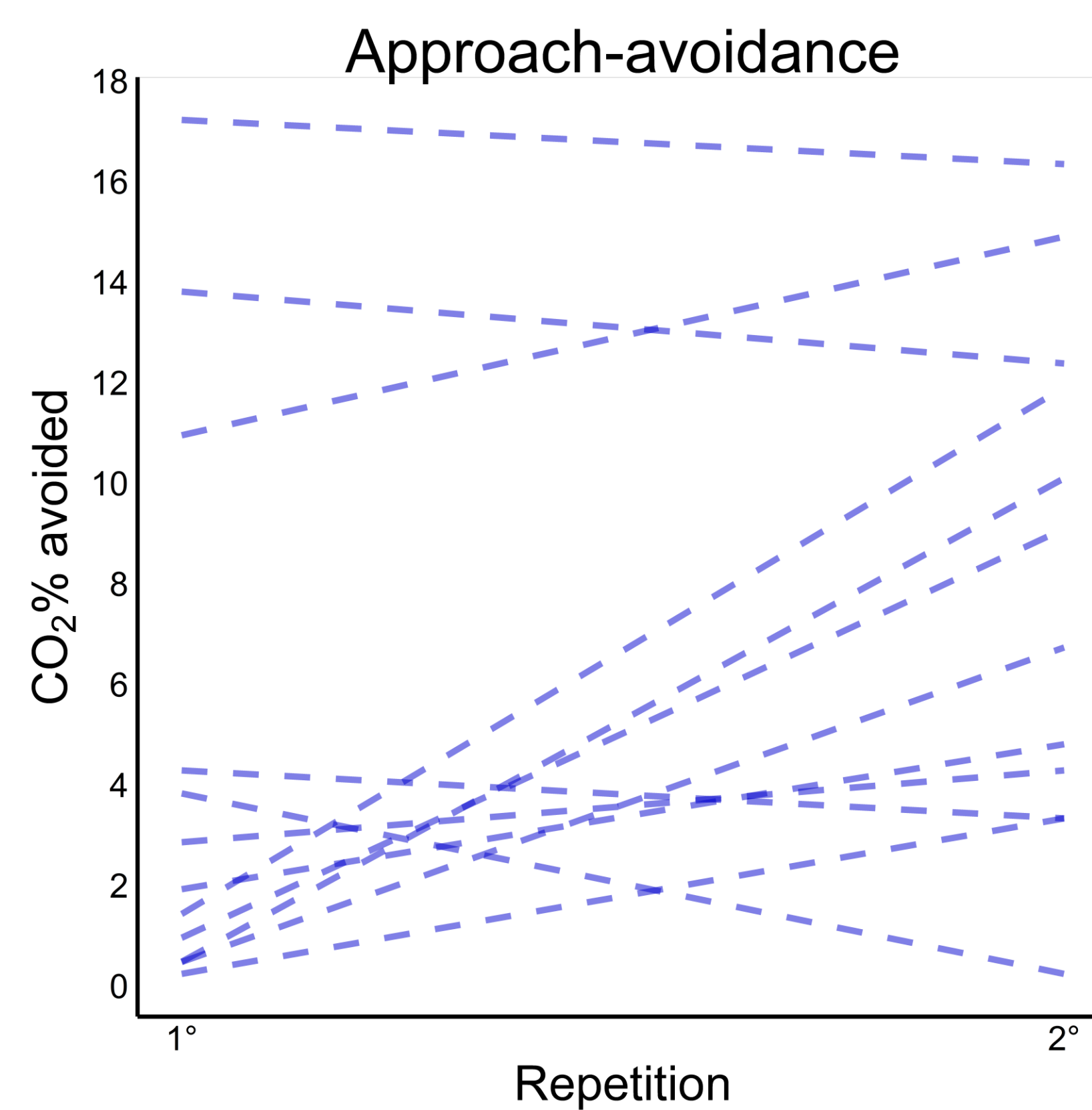


In approach-avoidance tests (2 repetitions/rat) rats could either stay in the lower cage and consume a valuable food reward but with exposure to CO<sub>2</sub> gradual fill (18% volume min<sup>-1</sup>) or escape to the upper cage

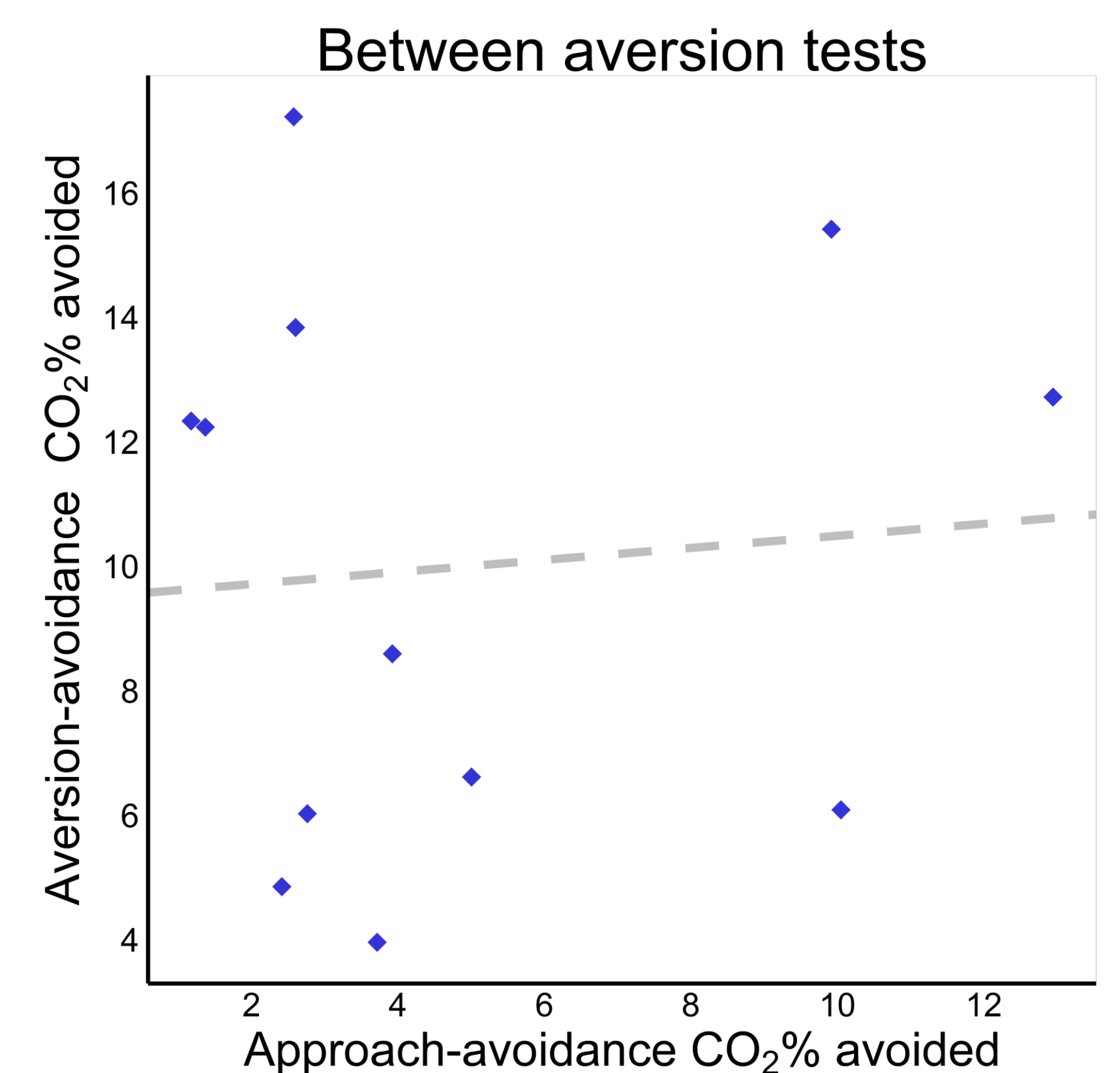
## Results



Rat identity explained 86% of the variability in the aversion-avoidance responses. The strength of aversion (i.e. % CO<sub>2</sub> when the rat left the chamber) was consistent within rat across the two tests ( $r_s=0.71, p<0.01$ ).



Rat identity explained 64% of the variability in the approach-avoidance responses. The strength of aversion (i.e. % CO<sub>2</sub> when the rat left the chamber) was consistent within rat across the two tests ( $r_s=0.55, p<0.01$ ).



The strength of aversion to CO<sub>2</sub> was not consistent between aversion tests ( $r_s=0.07, p<0.83$ ). All rats ( $n=12$ ) in all tests left the chamber before signs of ataxia.

## Summary and Conclusion

Rats were highly variable in their responses, but all rats found the CO<sub>2</sub> aversive. Individual animals were consistent in their responses within the aversion-avoidance and the approach-avoidance tests, but there was no consistency between these tests. These results suggest that the responses on the two different tests are influenced by different rat personality traits; e.g. individuals' strength in promotion vs. prevention motivation.

<sup>1</sup> Wong, D., Makowska, I. J., & Weary, D. M. (2013). Rat aversion to isoflurane versus carbon dioxide. *Biology letters*, 9, 20121000

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