

Oxygen consumption differences in intermittent-fasted animals

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Background

Intermittent fasting (IF) is a promising strategy to protect against cognitive impairment, such as in the case of Alzheimer's Disease (AD). Our recent studies have found that young male rats introduced to 10 weeks of alternate-day fasting had significantly reduced body weights, compared to the ad-libitum (AL) control group. However, no significant differences were observed in female body weights even though both males and females had reduced food intake. This sexual dimorphism might be due to changes in resting whole-body metabolism. The study aimed to explore whether IF impacts overall oxygen consumption and carbon dioxide production and whether these effects vary between sexes.

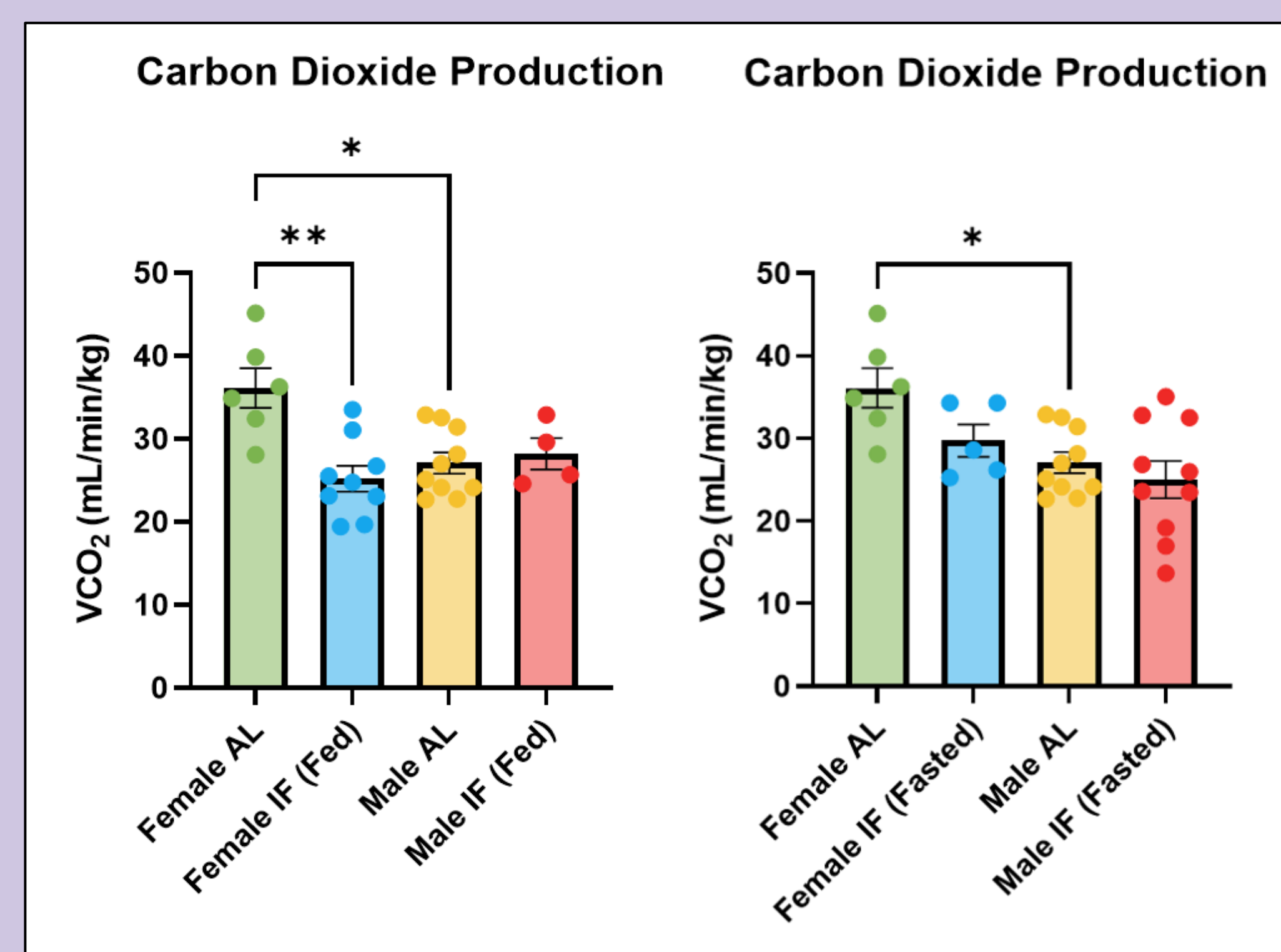
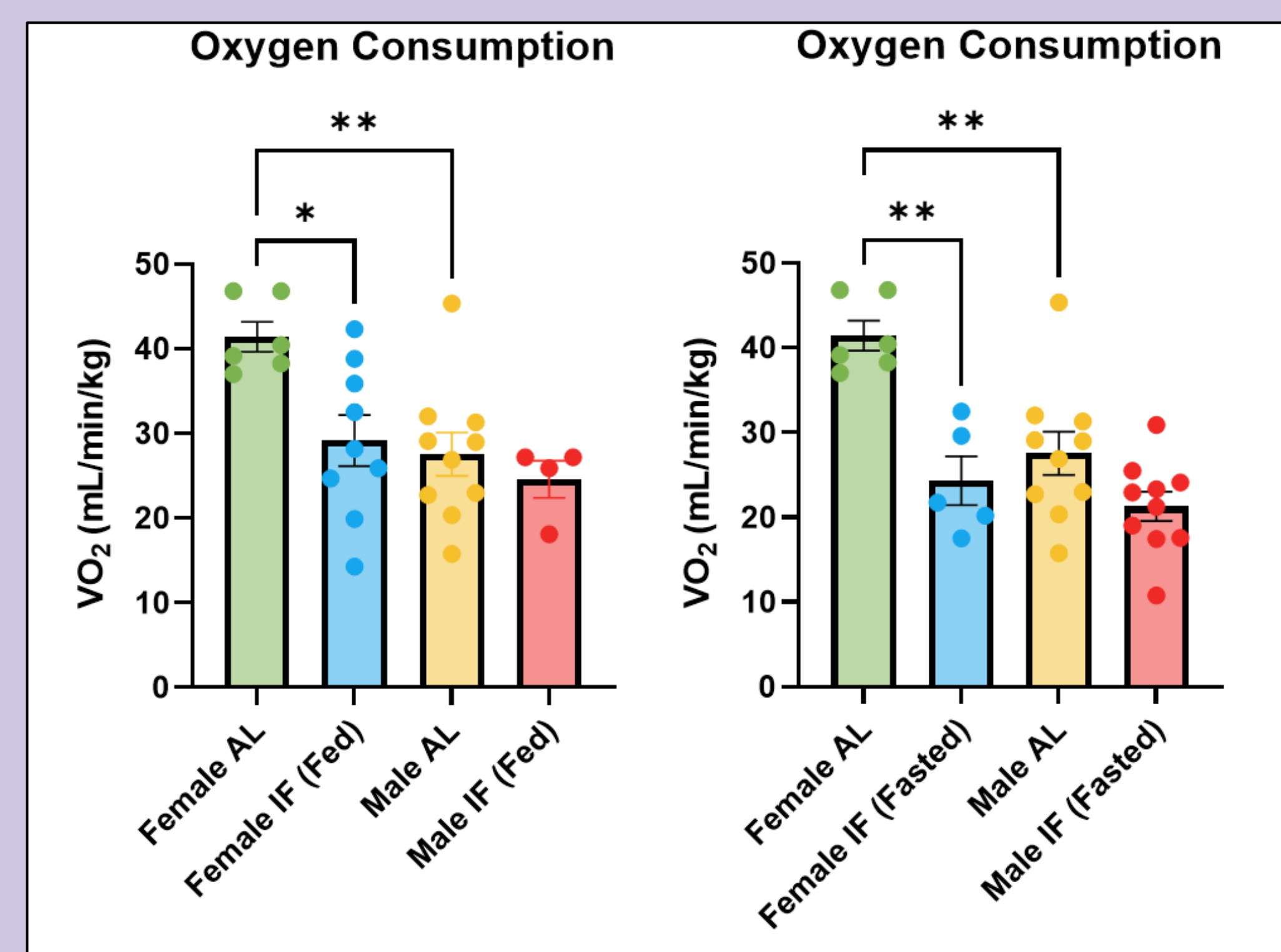
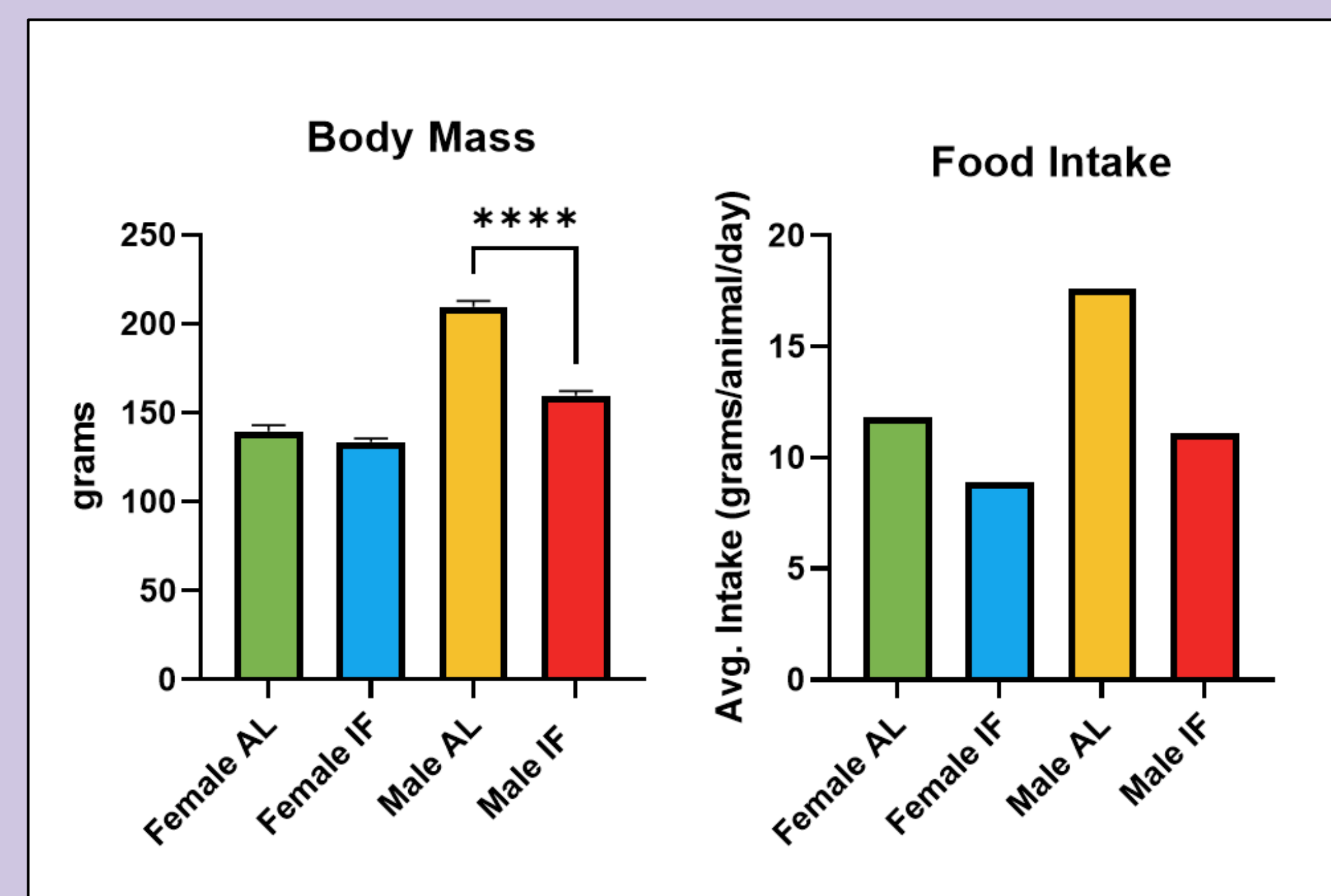
Methods

Experimental design: Forty 10-week-old female and male Fisher-344 rats were purchased (Envigo) and housed 4 animals per cage, on a 12:12 light: dark cycle in the Kansas State University comparative medicine group facility. Animals were randomly assigned to wither a four-week intermittent fasting (IF) intervention or allowed access to food ad libitum (AL). At the end of the intervention, O₂ consumption, CO₂ production, and Respiratory Exchange Ratio (RER) were assessed in each animal. Following tests, animals were euthanized, and tissue masses were documented.

Intermittent fasting intervention: IF groups were put on an alternate day feed/fast schedule for four weeks. Food was removed or given at the start of the dark cycle each day. IF groups had access to water ad libitum at all times. AL groups had access to both food and water ad libitum at all times. Food and body weights were documented at the beginning and end of each week.

Resting VO₂/CO₂: Animals were placed in a container with O₂ and CO₂ analyzers. Measurements were taken every minute for 10 minutes and averaged out. Room O₂ and CO₂ were taken into consideration. O₂ consumption and CO₂ production were measured on IF fasted and fed days, but no significant differences were found between the two days.

Results



Key Findings

- IF female seemed to adapt to IF and slow their metabolism to match their decreased food intake.
- IF females maintained a steady body mass, whereas male IF rats had a significant loss of body mass.
- AL females both consume more O₂ and produce more CO₂ than AL males.
- In IF females, both O₂ consumption and CO₂ production were decreased.
- There were no significant differences of RERs between any groups.

Going forward, we will be assessing body composition changes and biochemical changes in the adipose and skeletal muscle tissues to further understand IF and its effects in both sexes.

References

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