Effects of Short-Term High-Fat Diet on Anxiety Behaviour in Male and Female Mice

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INTRODUCTION

Obesity is a global epidemic which is caused by an imbalance between calorie intake and expenditure. It may bring about several consequences including cognitive problems (González-Muniesa, 2017). Feeding of mice with high fat diet is a commonly used obesity model. Previous studies showed that high fat diet may be related with anxiety behaviour. For instance, feeding of mice with high fat diet for 4 months caused anxiety like behaviour (Dutheil, 2016). Another study reported that lard based high fat diet cause more anxiety-like behaviour than fish oil based high fat diet (Mizunoy, 2013). In this study, we investigated effects of 8 weeks high fat diet feeding on anxiety behaviour in mice.

MATERIALS & METHOD

In this study, male (n=7) and female (n=8) C57BL/6 mice were fed by High-Fat Diet (HFD, 60%) for two months. Control animals (n=8) were fed with standard mice diet. At the end of two months, anxiety behaviour was assessed by using elevated plus-maze, light-dark box and open field test. For female animals, oestrous cycle was monitored, and only those female mice on diestrous stage were chosen for behavioural experiments. Three-day interval was given as battery time between the behavioural tests. Student's t-test was used for statistical analysis

RESULTS

In the elevated plus-maze, both male and female animals spent almost equal time in close and open arms. There was no significant difference between HFD and control groups in terms of gender. Distance covered by HFD animals was significantly higher than control animals in the elevated plus-maze for males ($p<0.05$). There were differences in walking distance parameter between female control and HFD groups, but these changes were not significant. Anxiety scores tested in the light-dark box test were not significantly different in the HFD group which spent more time in the dark area. Similar results were observed in the open field test and animals mostly spent their time in the outer area.

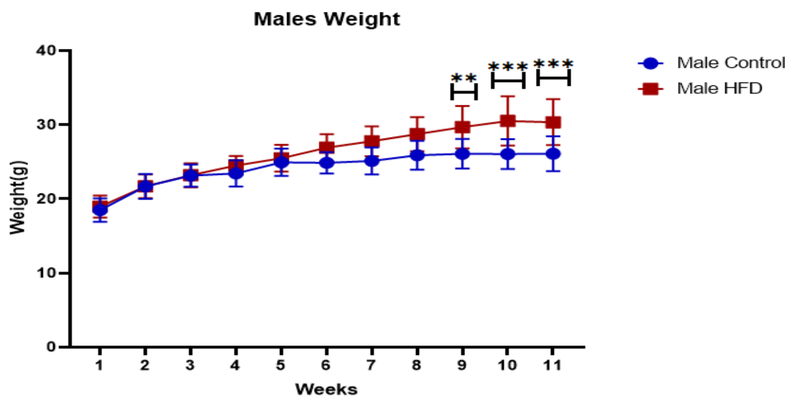

Figure 1: Weekly body weight changes of male animals who consume chow diet and high-fat diet (n=8, p<0.05, Two-way ANOVA).

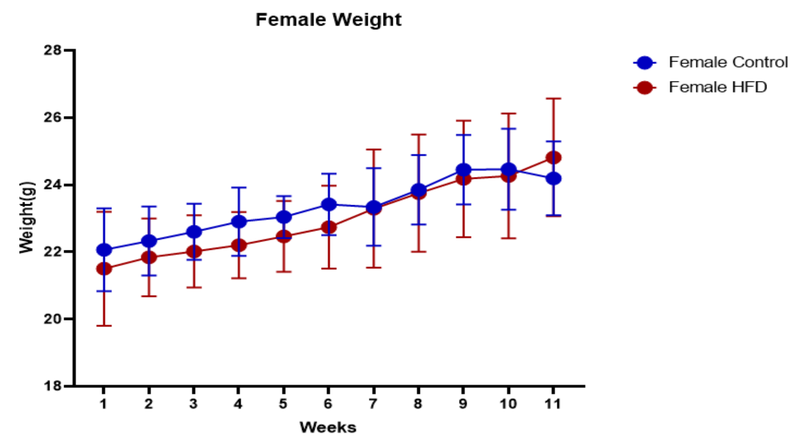

Figure 2: Weekly body weight changes of female animals who consume chow diet and high-fat diet (n=8, p<0.05, Two-way ANOVA).

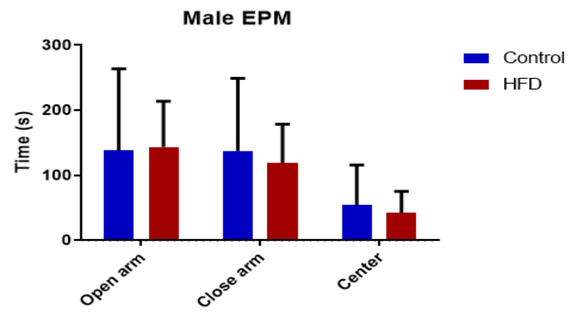

Figure 3: Elevated Plus Maze results of male mice time spent on open arm, close arm and center (n=8, p<0.05, Two-way ANOVA).

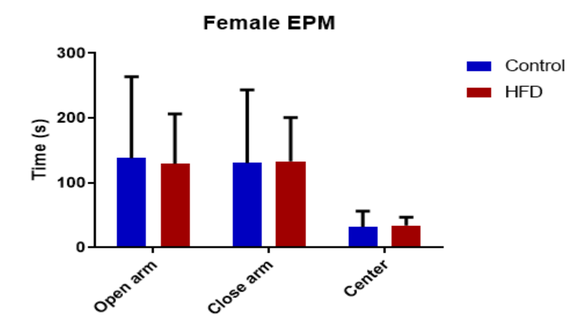

Figure 4: Elevated Plus Maze results of female mice time spent on open arm, close arm and center (n=8, p<0.05, Two-way ANOVA).

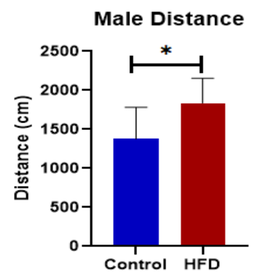

Figure 5: Elevated Plus Maze results of male mice total distance moved (n=8, p<0.05, Student's t-test).

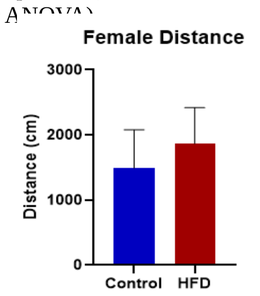

Figure 6: Elevated Plus Maze results of female mice total distance moved (n=8, p<0.05, Student's t-test).

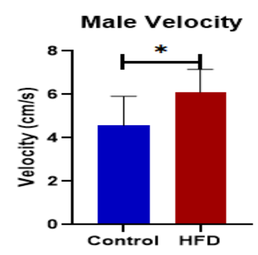

Figure 7: Elevated Plus Maze results of male mice velocity (n=8, p<0.05, Student's t-test).

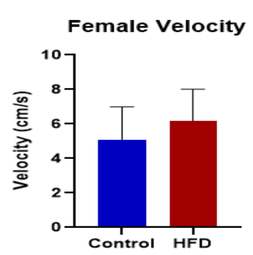

Figure 8: Elevated Plus Maze results of female mice velocity (n=8, p<0.05, Student's t-test).

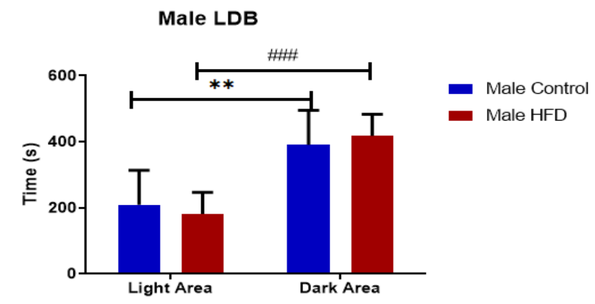

Figure 9: Light Dark Box results of male mice time spent on dark area and light area (n=8, p<0.05, Two-way ANOVA).

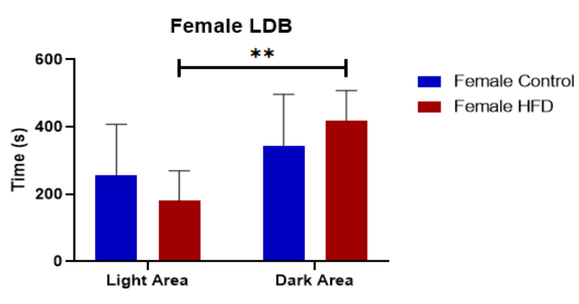

Figure 10: Light Dark Box results of female mice time spent on dark area and light area (n=8, p<0.05, Two-way ANOVA).

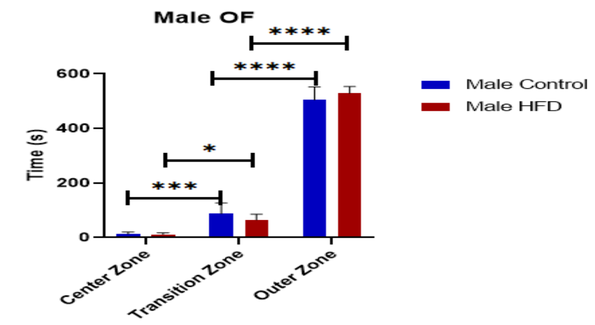

Figure 11: Open Field Test results of male mice time spent on center zone, transition zone and liouter zone (n=8, p<0.05, Two-way ANOVA).

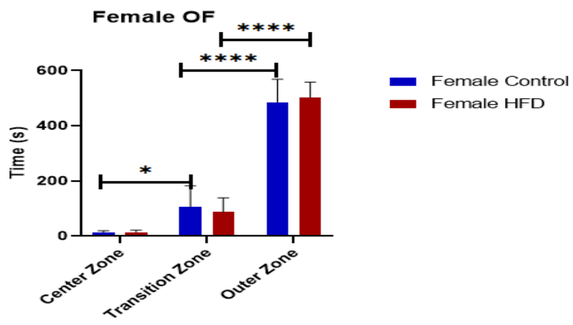

Figure 12: Open Field Test results of female mice time spent on center zone, transition zone and liouter zone (n=8, p<0.05, Two-way ANOVA).

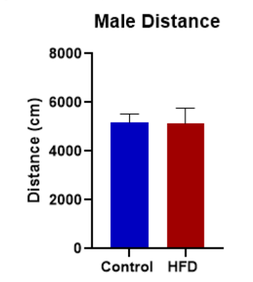

Figure 13: Open Field Test results of male mice total distance moved (n=8, p<0.05, Student's t-test).

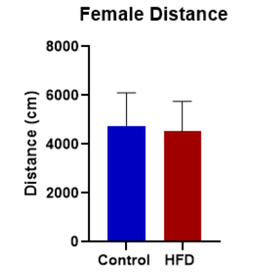

Figure 14: Open Field Test results of female mice total distance moved (n=8, p<0.05, Student's t-test).

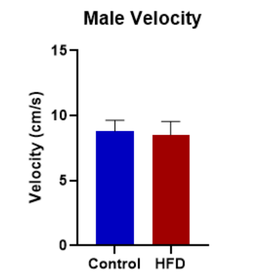

Figure 15: Open Field Test results of male mice velocity (n=8, p<0.05, Student's t-test).

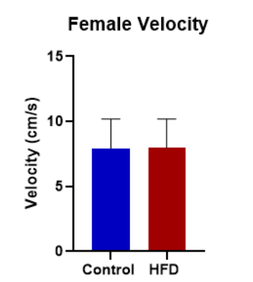

Figure 16: Open Field Test results of female mice velocity (n=8, p<0.05, Student's t-test).

CONCLUSION

Our results show that short-term high fat diet does not significantly affect anxiety behaviour in male and female mice. It is thought that in the anxiety tests utilized in the present study, light might be the only factor influencing the animals as an aversive factor.