*Supplementary Materials: Results*

Social Approach and Social Recognition

Chamber Time

After beginning with a simple model of varying intercepts to predict exploration time, fixed effect of chamber was added to the model which significantly improved the log likelihood ratio, $\chi^2(1) = 94.68$, $p < 0.001$. The model was not further improved with the addition of treatment, $\chi^2(1) = 0.04$, $p = 0.84$, or sex, $\chi^2(1) = 0.02$, $p = 0.90$. We then examined model fit by adding the interaction of treatment by chamber and the interaction of sex by chamber. Adding a treatment by chamber interaction significantly improved the model, 8.47, $\chi^2(1) = 8.47$, $p < 0.05$, but no changes were observed with the addition of the sex by treatment interaction, $\chi^2(1) = 0.68$, $p = 0.71$. Finally, no additional reductions were observed with the addition of the three-way interaction between chamber, treatment, and sex, $\chi^2(1) = 2.01$, $p = 0.37$. The type of chamber (mouse or object) significantly predicted exploration time with a greater time spent in the chamber with the novel mouse, $b = 96.03$, t(54) = 7.17, $p < 0.001$. For the interaction of chamber and treatment, there was as significant effect of treatment for the mouse chamber, with a positive slope indicating greater mouse exploration in the FA condition, $b = 30.78$, t(54) = 2.20, $p < 0.05$. However, differences in the object chamber between FA and CAPs mice did not reach significance, $b = -26.81$, t(54) = -1.91, $p = 0.06$.


Social Approach Chamber Time
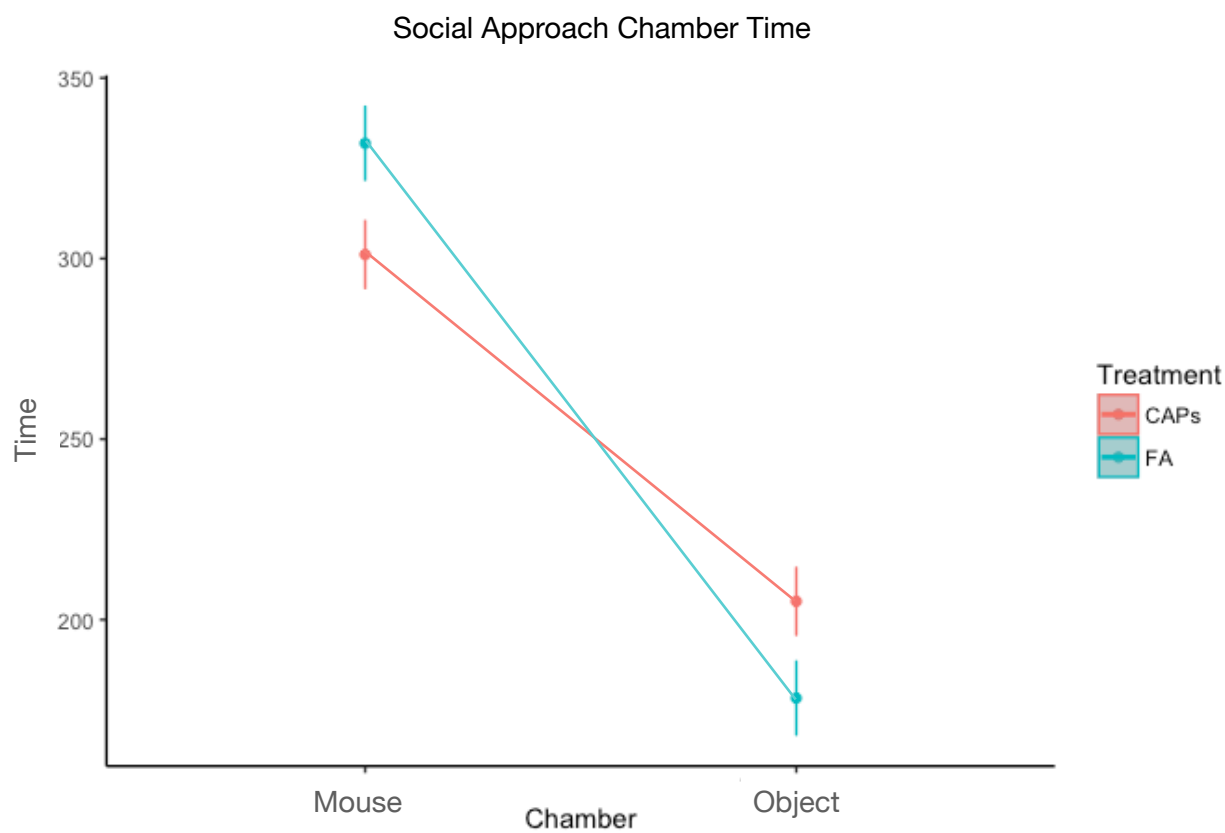
Sociability

      To determine whether sociability scores, time in mouse chamber minus time in object chamber, are predicted by treatment or sex, we first constructed a model with varying intercepts and then added treatment as a fixed effect. The addition of treatment significantly improved the model fit, $\chi^2(1) = 4.86$, $p < 0.05$, however the addition of sex did not significantly improve the model, $\chi^2(1) = 0.39$, $p = 0.53$. There was also no significant difference for the interaction of sex and treatment, $\chi^2(1) = 0.09$, $p = 0.77$. The effect of treatment on sociability revealed a positive and significant slope for the FA condition, $b = 58.28$, $t(23) = 2.22$, $p < 0.05$. That is, mice in the FA condition have higher sociability scores compared to the CAPs condition.

Sociability
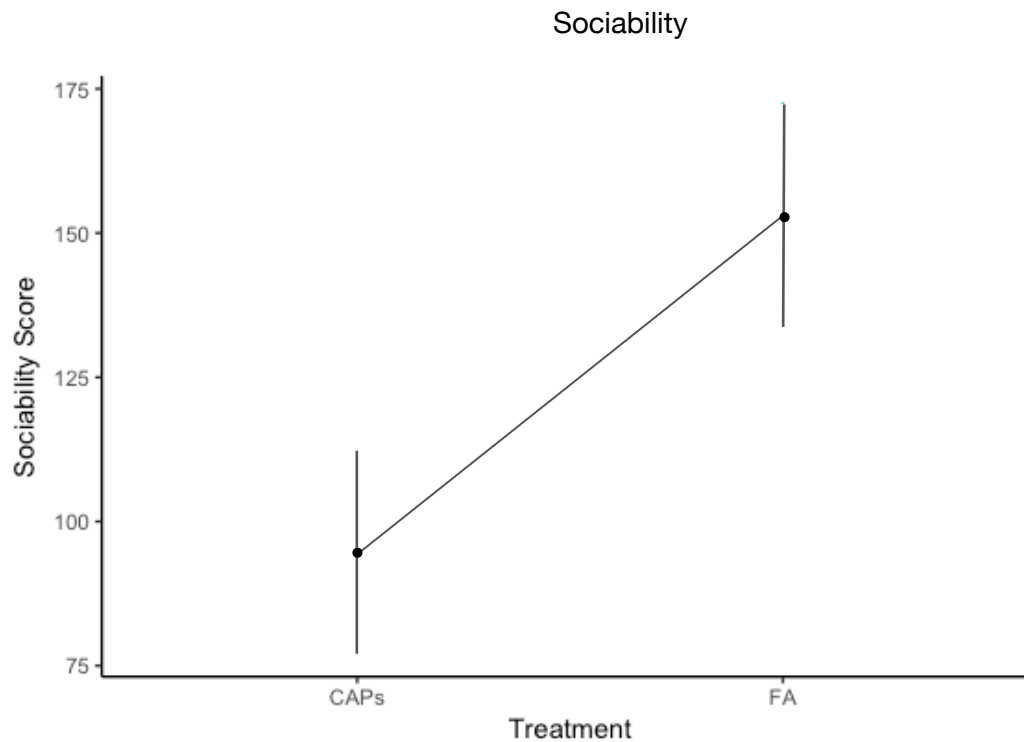
Sniff Time

  The regression model for time spent sniffing revealed a significant effect of chamber type, $\chi^2(1) = 72.28$, $p < 0.001$, with increases in sniffing observed in the mouse chamber, $b = 76.56$, $t(56) = 9.96$, $p < 0.001$. The model was not improved with the addition of treatment $\chi^2(1) = 0.80$, $p = 0.37$, or sex, $\chi^2(1) = 0.01$, $p = 0.995$, as fixed factors. However, the interaction of chamber and treatment significantly improved model fit, $\chi^2(1) = 9.31$, $p < 0.01$. Specifically, the CAPs condition significantly decreased sniff time in the mouse chamber, $b = -28.65$, $t(54) = -2.71$, $p < 0.001$, but not in the object chamber, $b = 14.99$, $t(54) = 1.4$, $p = 0.16$. These differences in slope demonstrate that mice in the CAPs condition spend less time sniffing a novel mouse compared to the FA mice.
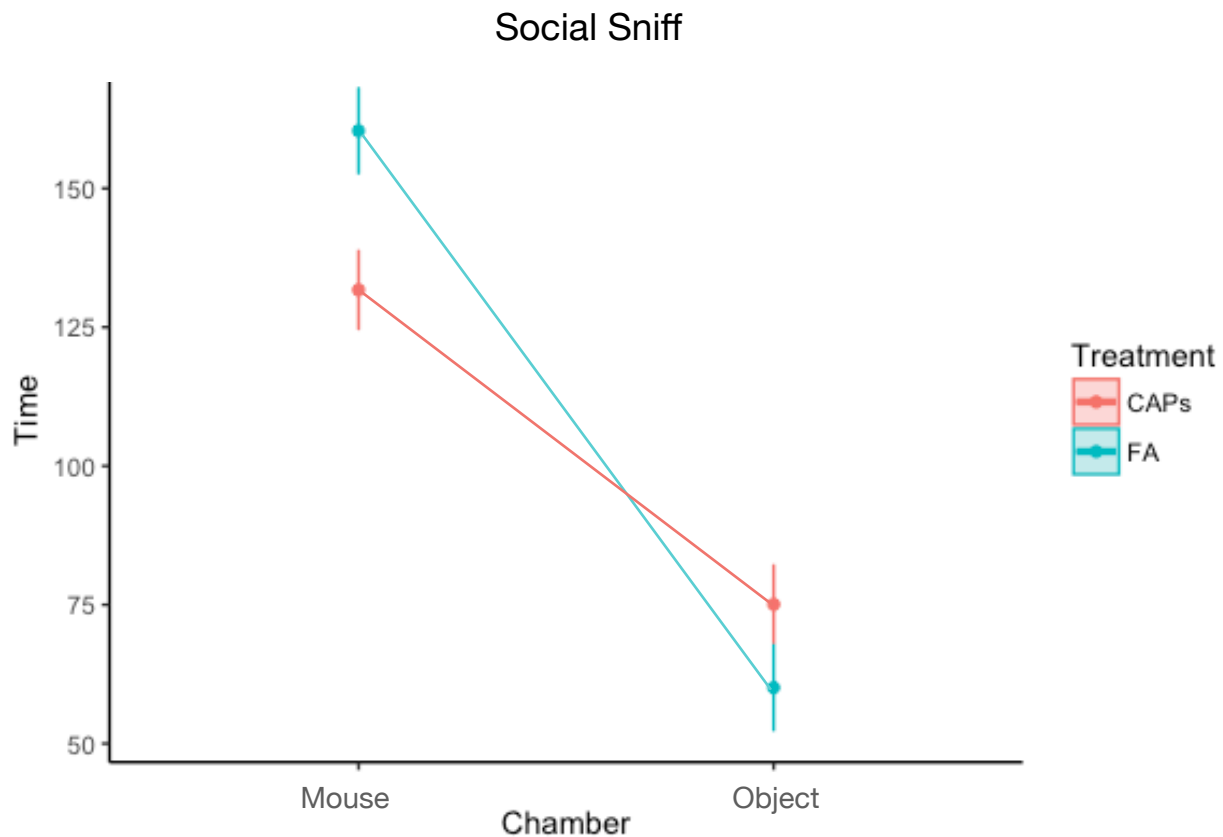
Social Recognition Chamber Time

      The chamber type (i.e. familiar mouse or novel mouse) significantly predicted exploration time as indicated by the likelihood ratio test, $\chi^2(1) = 65.06$, $p < 0.001$. The positive slope indicates greater exploration time in the novel mouse chamber, $b = 66.94$, $t(167) = 8.87$, $p < 0.001$. The model was not further improved by the addition of either fixed factor for treatment, $\chi^2(1) = 0.17$, $p = 0.68$, or sex, $\chi^2(1) = 0.02$, $p = 0.88$. Interestingly, the model was significantly improved by the addition of a three-way interaction between chamber, treatment, and sex, $\chi^2(1) = 17.82$, $p < 0.01$. This three-way interaction was examined by separate multilevel models for male and female conditions to determine the nature of the treatment by chamber interaction. While chamber type (preference for novel mouse) significantly predicts exploration time in male mice, $b = 67.79$, $t(79) = 4.71$, $p < 0.001$, there is no significant effect of treatment, $b = 14.31$, $t(14) = 0.41$, $p = 0.69$, and no significant interaction between treatment and chamber, $b = -22.09$, $t(79) = -1.07$, $p = 0.29$, for male mice. Conversely in female mice, the interaction of chamber type and treatment significantly predicted exploration time, $b = 78.33$, $t(85) = 4.15$, $p < 0.001$, with a positive slope indicating a greater difference in chamber exploration in the CAPs condition.
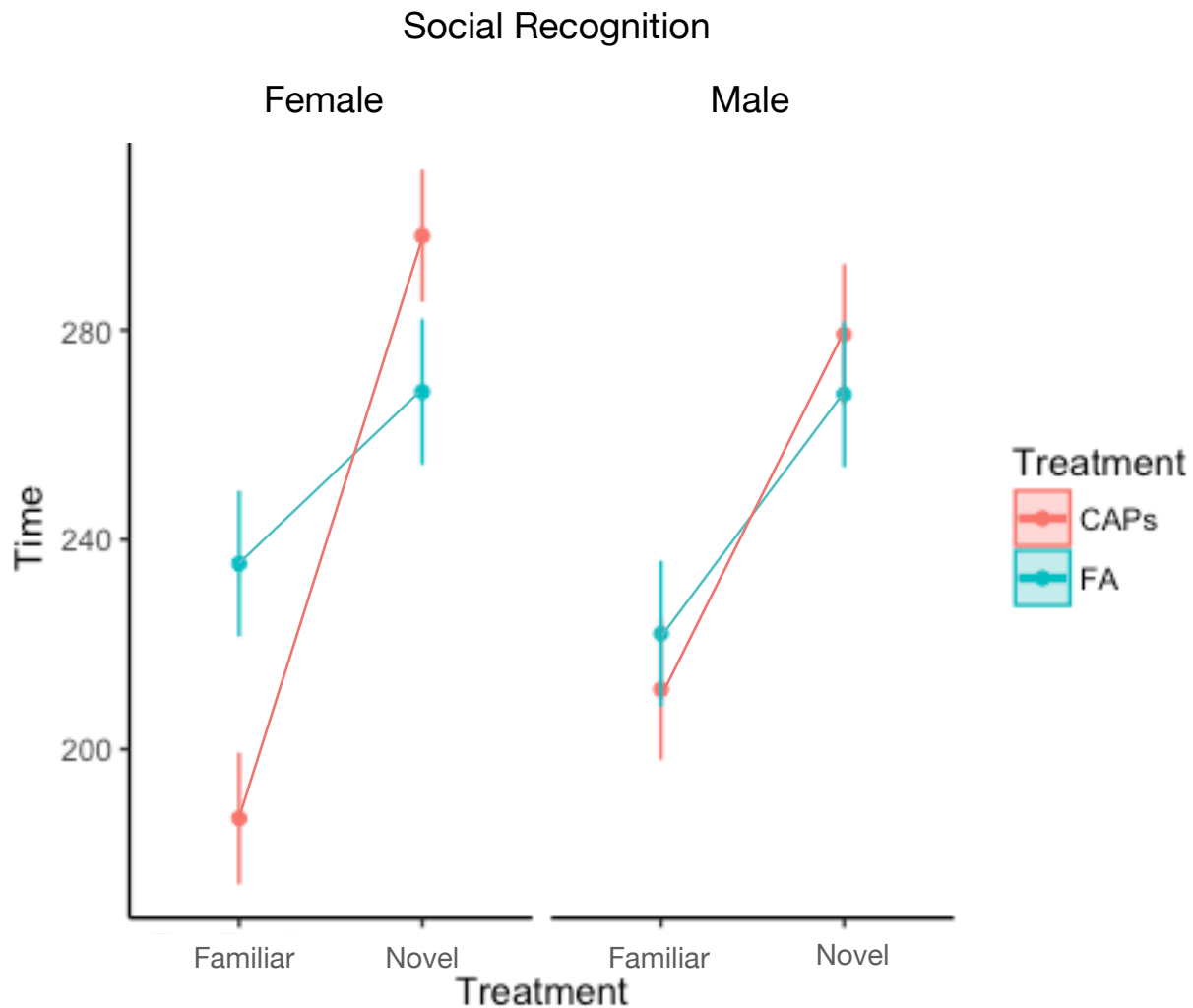
Reciprocal Social Interaction

Total Social Time

A model predicting total social time was constructed by first examining the influence of the fixed factors of treatment and sex to improve model fit. There was no significant improvement in model fit with the addition of treatment, $\chi^2(1) = 0.25, p = 0.62$, or sex, $\chi^2(1) = 2.97, p = 0.08$. However, the addition of the interaction between treatment and sex significantly improved the model, $\chi^2(1) = 8.15, p < 0.05$. Specifically, for male mice the slope of the interaction predicts a significant decrease in total social time for offspring in the CAPs condition, $b = -55.412, t(30) = -2.20, p < 0.05$.

Total Social Time
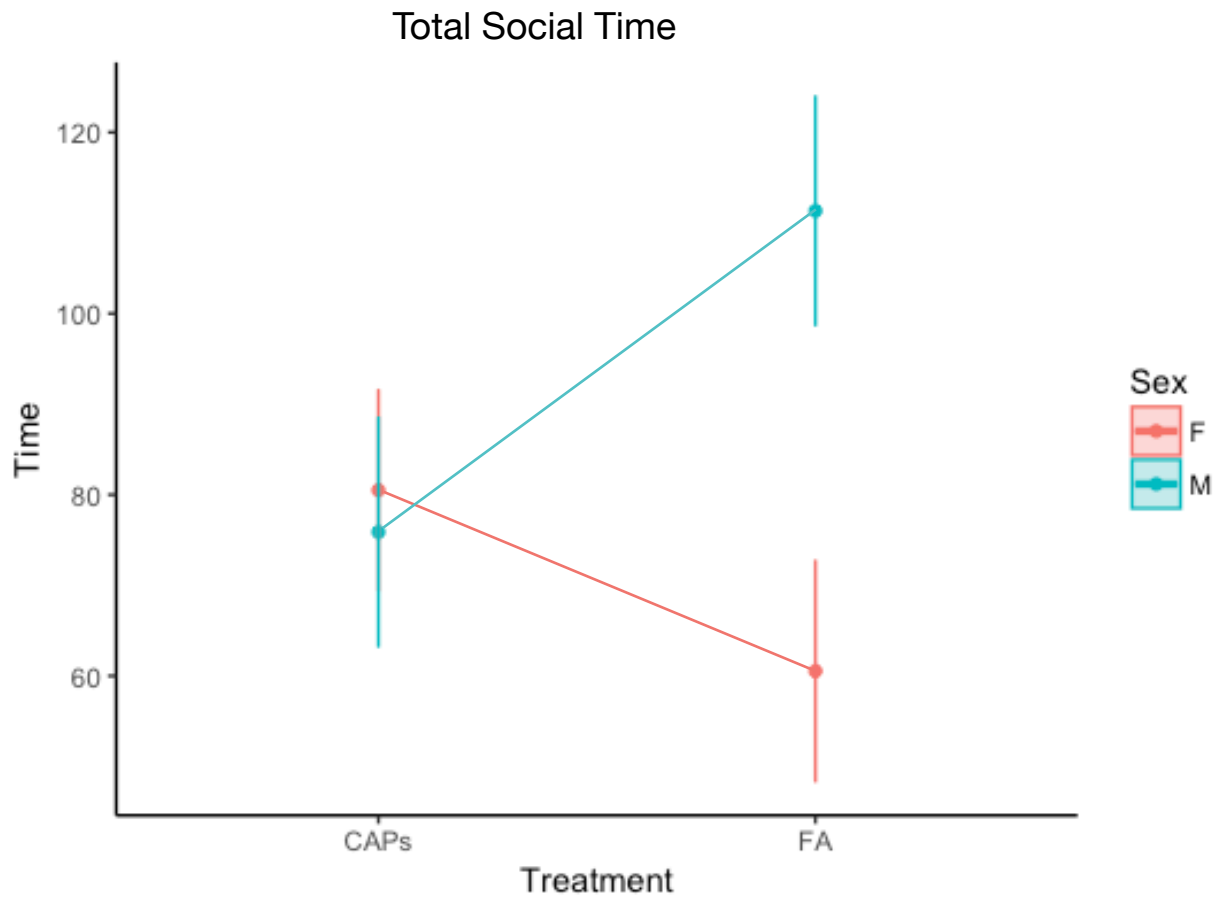
Nose to Nose

The fixed effect of treatment did not significantly predict nose to nose sniffing, $\chi^2(1) = 0.40$, $p = 0.53$. However, the model was significantly improved by including sex as a fixed effect, $\chi^2(1) = 8.66$, $p < 0.01$, and no further improvements in the model were observed when adding the interaction between sex and treatment, $\chi^2(1) = 1.80$, $p = 0.41$. The final model indicated a significant positive slope for sex, $b = 19.00$, $t(31) = 3.29$, $p < 0.01$ with more time in nose to nose interactions predicted for male compared to female mice.


Nose to Nose
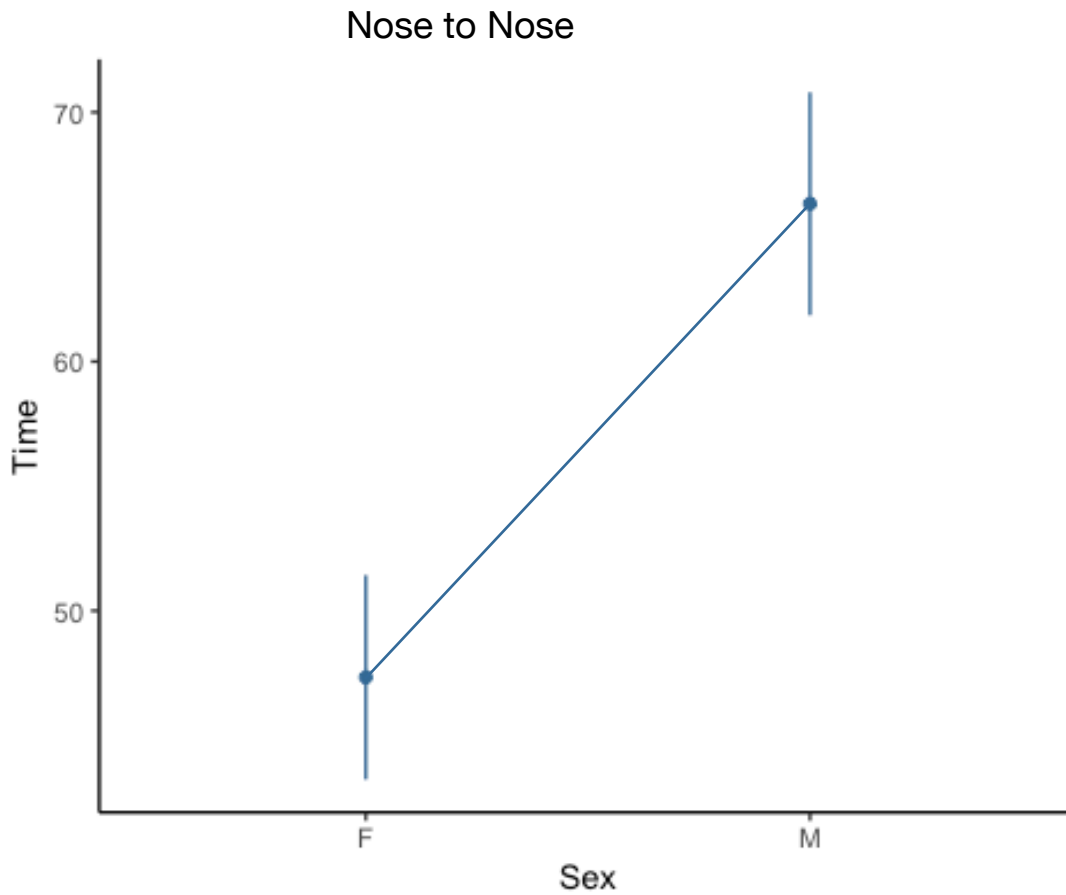
Body Sniff

      Time spent sniffing the body was not predicted by the fixed effect of treatment, $\chi^2(1) =$ 0.01, p = 0.90, or sex, $\chi^2(1) = 0.13$, p = 0.72. However, the addition of an interaction term between treatment and sex revealed a positive slope for male mice in the FA condition, $b =$ 23.80, t(30) = 2.26, $p < 0.05$, indicating higher levels of body sniffing predicted by male FA mice.
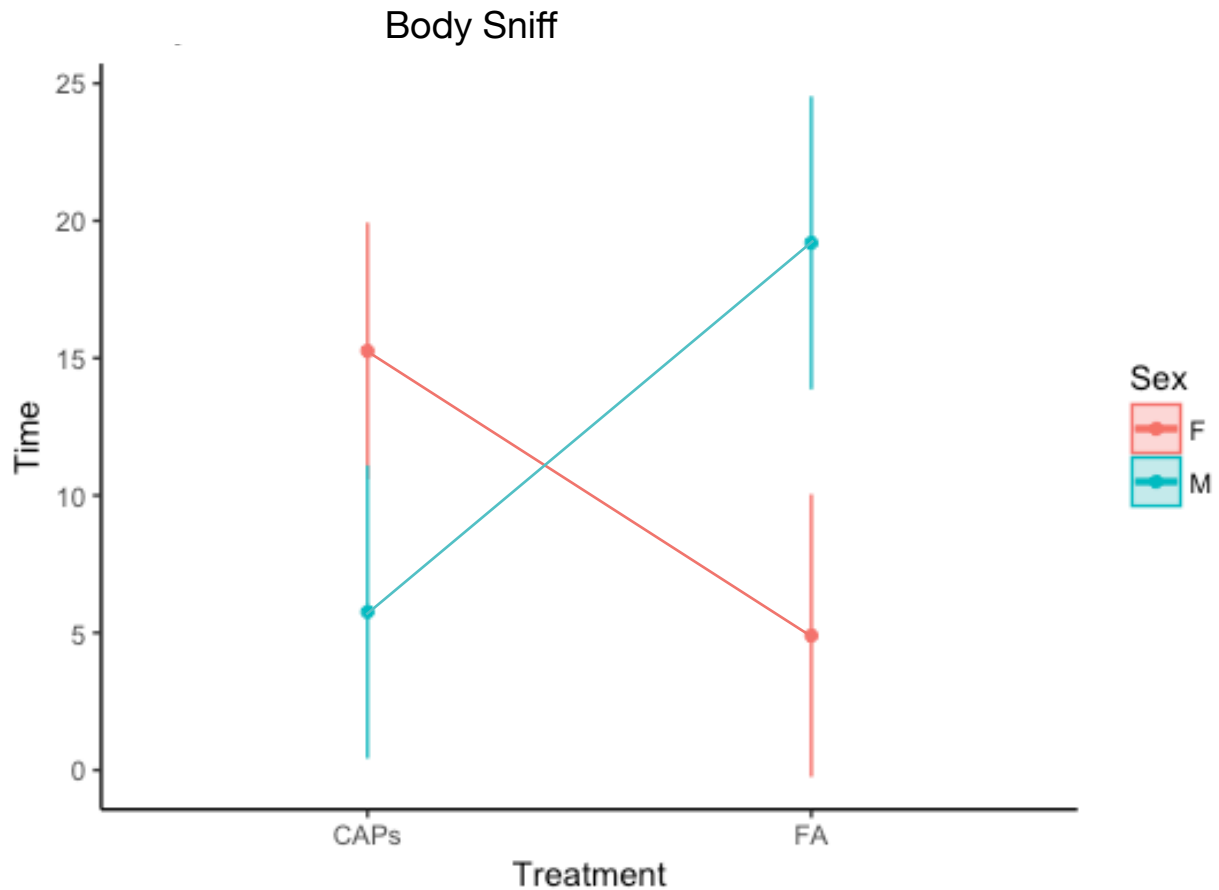
Anogenital Sniff

        For anogenital sniffing, there was no significant improvement in model prediction for either treatment, $\chi^2(1) = 0.31$, $p = 0.58$, or sex, $\chi^2(1) = 0.81$, $p = 0.36$. However, the model was significantly improved with the addition of a treatment by sex interaction term, $\chi^2(1) = 5.72$, $p = 0.05$. The interaction effect reflects increases in anogenital sniffing in male mice from the FA condition, $b = 16.17$, $t(30) = 2.31$, $p < 0.05$.
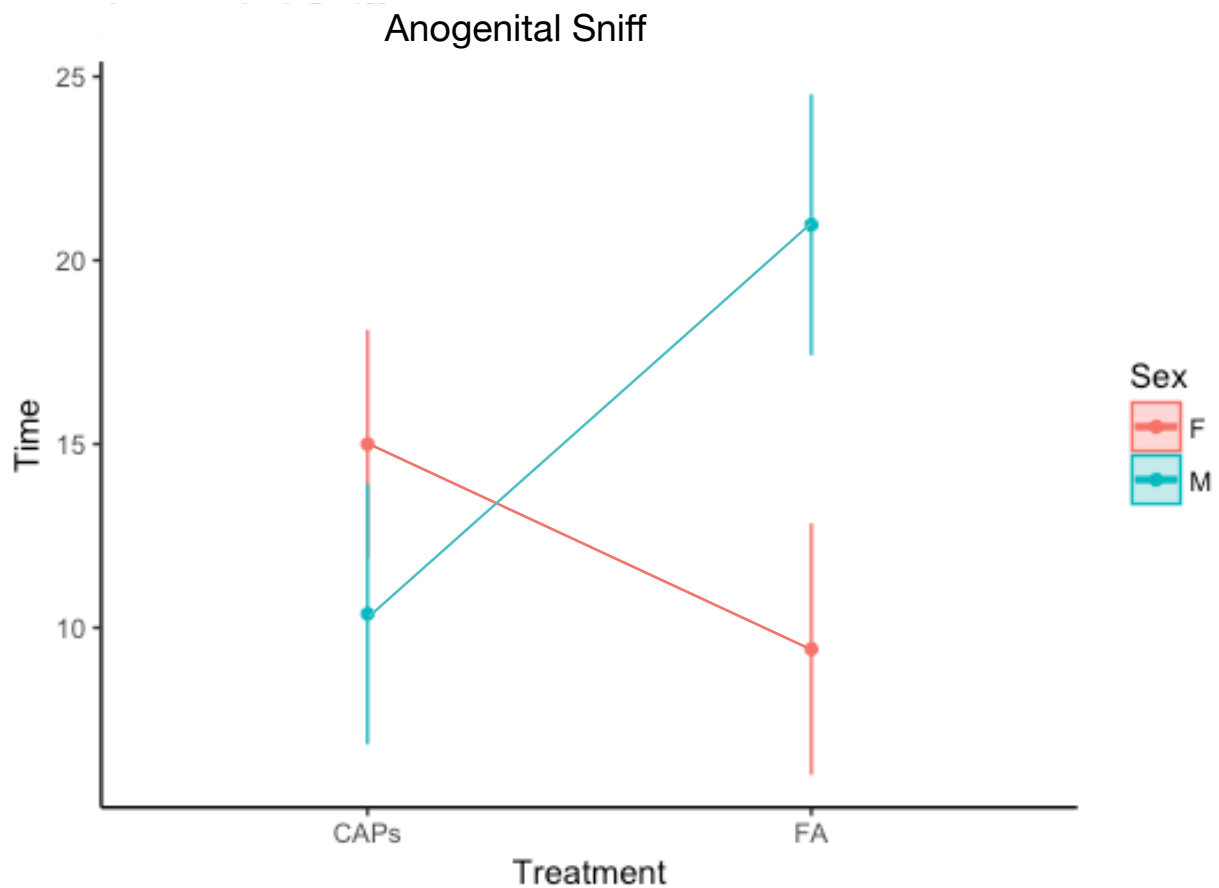
Grooming

      The inclusion of sex and treatment as fixed factors did not significantly improve the regression model, $\chi^2(1) = 0.35$, p = 0.55. That is, the slope for treatment was not significant, $b = 11.41$, t(35) = 1.11, p = 0.27, and sex did not significantly predict grooming behavior, $b = 10.77$, t(18) = 1.09, p = 0.29. However, there was a significant interaction between sex and treatment for male mice, $b = -31.87$, t(18) = -2.18, $p < 0.05$, with a negative slope indicating a reduction in predicted grooming time in male mice in the FA condition.
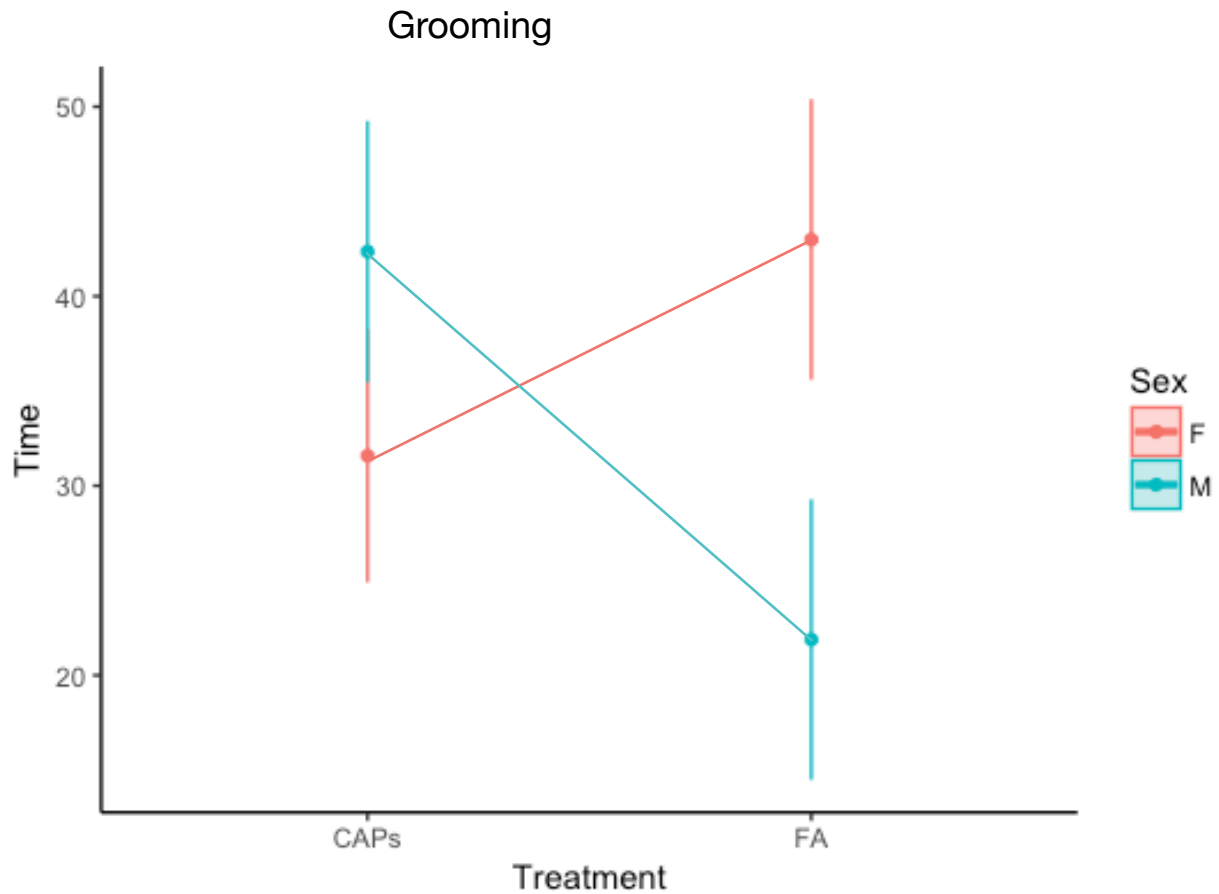
Elevated Plus Maze

For the percent time in the open arm, there was a significant reduction in the likelihood ratio when sex was included in the model, $\chi^2(1) = 3.93$, $p < 0.05$. Conversely, the addition of treatment did not further improve the model, $\chi^2(1) = 1.43$, $p = 0.23$. Moreover, there was no effect of the interaction between sex and treatment on percent open arm exploration, $\chi^2(1) = 1.52$, $p = 0.22$. The final model indicated an increase in percent of time exploring the open arm in male mice as indicated by a small positive slope, $b = 0.09$, $t(31) = 1.98$, $p = 0.05$.
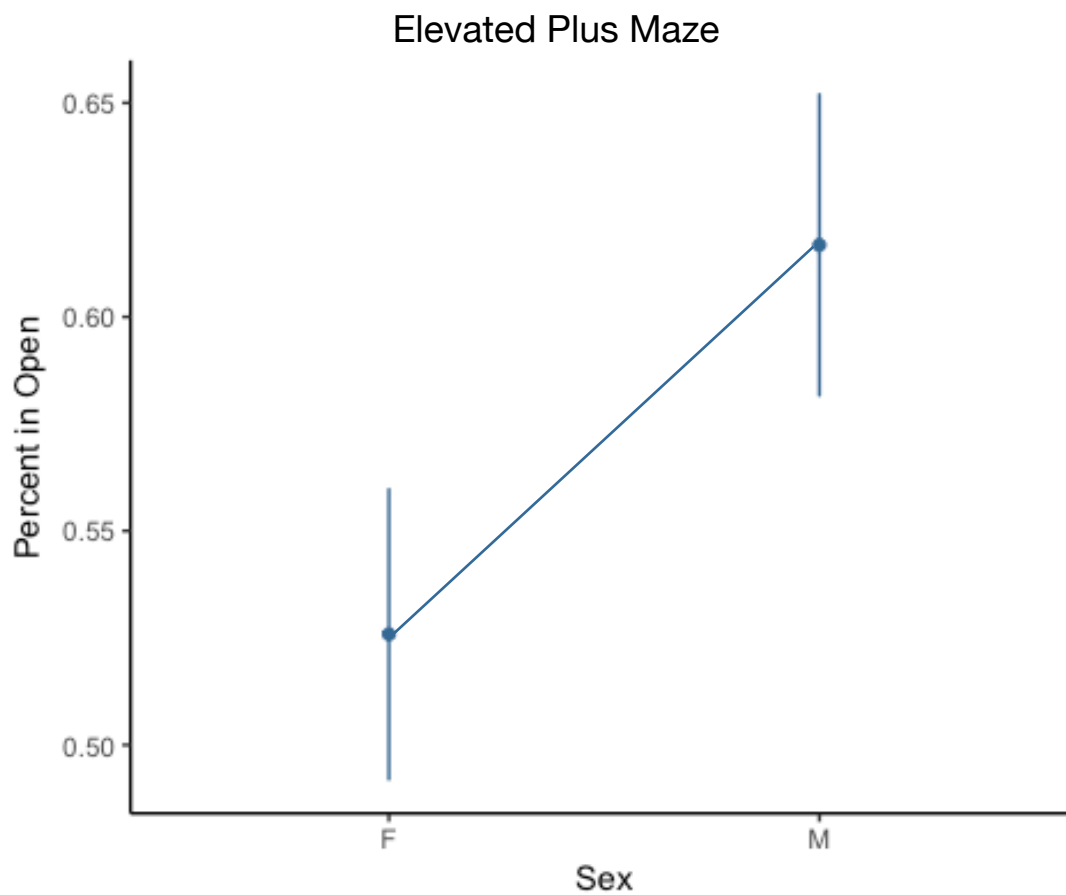
Open Field

   In the open field arena, treatment did not significantly predict distance traveled, $\chi^2(1) =$ 0.26, p = 0.61. However, the relationship between sex and distance showed significant variance in intercepts, $\chi^2(1) = 5.95$, p < 0.05. The model was not further improved by the addition of a sex by treatment interaction, $\chi^2(1) = 0.96$, p = 0.62. In the final model there was a significant effect of sex on total distance traveled, $b = -1270.72$, t(18) = -2.534, $p < 0.05$, with a negative slope indicating a reduction in motor activity in male mice compared to females.