Approximately 1 out of every 68 children in the US are diagnosed with Autism Spectrum Disorder (ASD). ASD is a heterogeneous neurodevelopmental disorder that has widespread activation of brain immune cells that produce inflammation. Data suggest diet can be used to control inflammatory effects in other conditions, such as diabetes, which is regulated by the anti-inflammatory characteristics of zinc. Our aim is to assess whether manipulation of dietary zinc and fat have interacting behavioral and physiological effects on mice. In this study, an inbred polygenic mouse model of autism (BTBR) was used. Mice (54 M, 61 F) were separated into 6 groups, based on dietary zinc (low, normal, high), and fat (normal, high) content. Behavior was analyzed using open field, 3-chamber, and an elevated +-maze tests, recorded from the side and/or above, and analyzed using in-house machine vision software. Only open-field data are presented here. Data were collated in excel and analyzed via multi-level ANOVA in R.