Zebrafish are robustly responsive to psychological and pharmacological challenges, including ethanol, caffeine, nicotine, fluoxetine, opiates, and benzodiazepines. Their affective behavior also correlates with physiological indices, such as whole-body cortisol. Recently, our lab has been investigating the effects of lysergic acid diethylamide (LSD) on zebrafish behavior and physiology. We have examined different exposure doses and treatment times in the novel tank diving test (NT). Overall, LSD appears to have a psychostimulant effect across all primary endpoints, such as decreased latency to the upper half, increased number of transitions and time spend in the upper half, and reduced erratic movements and freezing behaviors. Moreover, there is also a noticeable decrease in the average angular velocity and turn angle in LSD fish without differences in mean velocity or distance traveled over the experimental trial. These endpoints suggest a calm, smooth swimming pattern across the NT. In a light-dark box test, LSD fish showed an initial preference for the light half spending more time there during the first four minutes, and less transitions between light and dark throughout the trial. This also suggests that LSD has a distinguished anxiolytic effect on zebrafish behavior. Overall, these pilot tests are providing the necessary foundations to move forward with adult zebrafish behavioral research using LSD and other hallucinogenic drugs (i.e., MDMA “ecstasy”).