The Effects of Chlordiazepoxide on Shoal Cohesion in Adult Zebrafish

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Abstract

Zebrafish (Danio rerio) have become an increasingly popular research animal in the field of behavioural neuroscience. Due to their tendency to swim in groups, a behaviour known as shoaling, zebrafish are a common model organism used to gain insight towards the neural mechanisms that underlie social behaviour. Importantly, this freshwater fish shows brain structure and chemistry similar to that of mammals, thus pharmacological agents can be used to manipulate the functioning of specific neural pathways shared by humans and zebrafish. The aim of the current research was to investigate the effects of an anxiolytic drug, chlordiazepoxide, a GABAA receptor antagonist, on the shoaling behaviour of zebrafish. To do this we exposed groups of zebrafish (5 fish per group) to either 0 mg/L (control), 1 mg/L, 5 mg/L, or 15mg/L of chlordiazepoxide then placed them in an open field test. We used a motion-tracking software system to quantify behaviours such as shoal cohesion, thigmotaxis (wall-hugging, indicative of anxiety), and immobility. High doses of chlordiazepoxide (15 mg/L) significantly decreased shoal cohesion and thigmotaxis, whereas immobility was significantly increased. Low doses (1mg/L) showed no effect on shoal cohesion or thigmotaxis, however, immobility slightly increased. These results are consistent with chlordiazepoxide being an anxiolytic agent and suggest that shoal cohesion is an appropriate proxy for anxiety-like behaviour in zebrafish.

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