



## Larval Zebrafish's Sophisticated Short-term Memory Shares Key Features of Working Memory with Mammals

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Working memory is a central component of cognition, where sensory information is kept in mind and processed to make better-informed decisions. Working memory is considered to exist only in a few select species, namely humans and monkeys, and to a lesser degree rodents, adult zebrafish and honeybees. In this project, we are challenging this idea by showing that one-week-old larval zebrafish also have complex memories, sharing many of the central characteristics of working memory with mammals. These characteristics include being short term, lasting for around 20 to 30 seconds, its use being dependent on context, being covert, resetting after use and the ability to manipulate information kept in memory. The detailed characterization of larval zebrafish's natural behaviours allows us to use them as building blocks to create behavioural assays. As such, we developed a working memory-like assay in larval zebrafish, which includes the use of a past visual cue as information to guide decision-making when the fish escapes an acoustic stimulus, presented after a time delay. Leveraging this assay, we found evidence that zebrafish larvae can hold the memory of the cue for around 20 seconds, showing a timescale comparable to mammalian working memory. After a first decision is made however, a second decision is unbiased, showing the memory is reset. We also found that this memory is not visible on the animal's behaviour, being covert and is only used in contexts where there is lack of information. Additionally, we modified the original assay to create a memory manipulation assay. This allowed us to show that zebrafish larvae can manipulate information obtained from at least two distinct cues to use them together to make a more accurate decision. In this project, we were able to show that zebrafish larvae form memories that share main characteristics of mammalian working memory.

**working memory, larval zebrafish, behaviour, cognition**