Short term memory

Short-term memory (or “primary” or “active memory”) is the capacity for holding, but not manipulating, a small amount of information in mind in an active, readily available state for a short period of time. The duration of short-term memory (when rehearsal or active maintenance is prevented) is believed to be in the order of seconds. A commonly cited capacity is The Magical Number Seven, Plus or Minus Two (which is frequently referred to as Miller's Law.) In contrast, long-term memory can hold an indefinite amount of information.

Short-term memory should be distinguished from working memory, which refers to structures and processes used for temporarily storing and manipulating information.

Short-term memory (STM) is crucial for animals to hold information for a small period of time. Persistent or recurrent neural activity, together with neural oscillations, is known to encode the STM at the cellular level. However, the coding mechanisms at the microcircuitry level remain a mystery. Here, we performed two-photon imaging on behaving mice to monitor the activity of neuronal microcircuitry. We discovered a neuronal subpopulation in the medial prefrontal cortex (mPFC) that exhibited emergent properties in a context-dependent manner underlying a STM-like behavior paradigm. These neuronal subpopulations exclusively comprise excitatory neurons and mainly represent a group of neurons with stronger functional connections. Microcircuitry plasticity was maintained for minutes and was absent in an animal model of Alzheimer's disease (AD). Thus, these results point to a functional coding mechanism that relies on the emergent behavior of a functionally defined neuronal assembly to encode STM [1)].

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Tian Y, Yang C, Cui Y, Su F, Wang Y, Wang Y, Yuan P, Shang S, Li H, Zhao J, Zhu D, Tang S, Cao P, Liu Y, Wang X, Wang L, Zeng W, Jiang H, Zhao F, Luo M, Xiong W, Qiu Z, Li XY, Zhang C. An Excitatory Neural Assembly Encodes Short-Term Memory in the Prefrontal Cortex. Cell Rep. 2018 Feb 13;22(7):1734-1744. doi: 10.1016/j.celrep.2018.01.050. PubMed PMID: 29444427.