Supplementary methods

Training and recordings in head-restrained rats

After extensive handling and 2-5 days of habituation to the head fixed apparatus, rats (2 Long-Evans and 2 Sprague-Dawley, male, 150-300 g) were deeply anesthetized with isoflurane and placed in a stereotaxic frame (David Kopf Instruments, Tujunga, CA). Two stainless steel screws were inserted above the cerebellum, to be used as indifferent and ground electrodes during recordings. The coordinates of the future recording sites above the right and left hippocampi were marked on the skull (3-4 mm posterior to bregma, 1.5-3.5 mm from the midline). Two small metal bars (4 mm in diameter) were attached to the nasal and occipital parts of the cleaned skull with acrylic cement (Superbond, Sun Medical Co.). These bars served for subsequent painless fixation of the head. Additional screws were also inserted into the skull to secure the bars with the cement. After at least two days of recovery from surgery, the rat was habituated to the head-fixation device. The head was fixed by 4 screws driven into the bars but the rat’s body was lying comfortably in a Plexiglas tube, which prevented twisting of the body or reaching the top of the head with the forepaws. However, the forepaws could be used to hold wet cereal rewards (Froot Loops, Kellogg's). Over a period of 5-10 days, the rat was habituated to the head-fixation device by increasing the duration of the session daily until it remained calm and fell asleep. In the initial part of the session, the slightly water-deprived rat (20 h) was offered several wet Froot Loops. A trained rat remained relatively motionless for periods of up to 4 hours. Acceptance of Froot Loops and alternation of waking and sleep epochs were taken as indicators for the absence of stress. On the day of the recording, the rat was briefly anesthetized (20-30 min) with isoflurane and the recording silicon probe was inserted into the brain after removal of the overlying bone and dura mater. Once the probe was implanted in the superficial cortical layers, the exposed surface of the brain was covered with sterile wax. In addition, a 26-gauge needle connected to a flexible silastic tube was inserted into the peritoneal cavity for drug delivery by a custom-made perfusion system. After
termination of isoflurane anesthesia, the probe was gradually moved by 100-µm steps to reach the CA1 pyramidal layer in approximately two and an half hours by a micromanipulator (David Kopf Instruments,). The correct electrode placement was verified by the simultaneous presence of ripples and bursts of spikes. At the end of the recording session the electrode was removed and the hole was covered by sterile wax. Two recording sessions were done (one per hemisphere) per animal.

**Freely moving animals**

Five Long-Evans rats (male, 250-400 g) were water-deprived and trained to run for water rewards on an elevated track. One rat was trained run back and forth in a ‘C’ shape maze, while the remaining rats learned a spatial delayed alternation task in a figure ‘8’ shape maze (Fig. 2a, inset). In this task, rats are maintained for 10 seconds in a waiting area (‘w’, Fig. 2a inset) before being allowed to run into the central arm. At the choice point (‘c’), they have to choose between left and right turns. To obtain a drop of water in the reward area (‘r’), they are required to alternate directions between trials. The learning criterion for this task was fixed at 80 %. After training, the rats were implanted with either tetrodes (2 rats)\(^1\) or silicon recording probes (3 rats)\(^2\). Rats were manually injected intraperitoneally with CP55940 (0.1-0.3 mg kg\(^{-1}\)). One to 3 sessions were then recorded on the elevated track at various time intervals following the injection (20 min to 4 hours).

For the Δ\(^9\)-THC experiments, 2 Brown Norway/F-344 hybrid rats were food deprived to 80%–85% of ad lib weight and trained to run on a circular maze for food reward (Fig. 3a). Recordings took place either in their home cage (HC) or when running for reward on the maze (M). Multiple sessions were recorded in the following order: HC1-M1-HC2-M2-HC3-M3-HC4-M4-HC5. Δ\(^9\)-THC was injected intraperitoneally in the middle of the HC2 session.

**Local injection experiments**
Three Long-Evans rats (male, 250-600 g) were anaesthetized with a 25% solution of urethane (0.5 ml/100 g body weight, IP injection) and a Ketamine (100 mg ml\(^{-1}\))-Xylazine (10 mg ml\(^{-1}\)) cocktail (0.01 ml/100 g, intramuscular injection) and placed in a stereotaxic apparatus for acute implantation of a custom-made micro-drive. The plane of anesthesia was sustained throughout the experiments by subsequent injections of 0.02-0.05 ml of ketamine. The micro-drive contained two stainless steel guide-canulae (28 gauge; one in each hemisphere; Small Part Inc.) for drug injections and could move two sets of four tungsten wires (50 µm diameter) independently (see inset of Fig. 4a). The distance between the electrodes was approximately 300 µm. The micro-drive was implanted so that the electrodes were positioned slightly above the CA1 pyramid layer of dorsal hippocampus (AP: −3 mm, ML: +/-1.8 mm, DV: −1.8 mm). In addition, a bipolar stimulation electrode was implanted in the ventral hippocampal commissure (AP: −1.5 mm, ML: 1 mm; DV: 3.5 mm). The final position of the recording electrodes was determined by the presence of ripples, multi-unit activity and evoked population spikes in response to commissural stimulation. After recording baseline activity for an hour, stainless steel injection canulae (33 gauge) were slowly inserted through the guiding canulae to deliver CP55940 in one hippocampus and vehicle in the other. The position of the tip of the injection canulae were aimed 0.5 mm below the CA1 pyramidal layer. One µg of CP55940 (500 nl saline containing 0.2% of DMSO and 0.2% Cremaphor) or vehicle alone were infused with a Micro-Injection Pump (BioAnalytical Systems Inc) over a period of 5 to 10 minutes after which recording was resumed for one to two hours. The experiments were terminated by injecting 500 nl of a 10% solution of lidocaine to test for good delivery of the drug/vehicle. At the end of the experiments, the rats were perfused through the heart with a 10% Buffered Formalin Phosphate solution. The brains were cut and 60 um sections for stained with the Nissl method to confirm the position of the electrodes and the injection canulae.