Supplementary Methods

Surgical Procedure

For surgery, rats were anesthetized in an induction chamber whose air supply was connected to an isofluorane gas anesthesia machine (Benson Medical Supplies). The anesthetized rats were positioned in a Kopf stereotaxic instrument. All lesions were stereotaxically placed with coordinates, based on the Paxinos and Watson atlas\(^1\), measured in relation to bregma and the horizontal skull surface. The procedure for making hippocampal lesions was slightly modified from the technique developed by Jarrard and Meldrum\(^2\). Using a small dental burr, 8 holes were drilled through the skull directly above the hippocampus in each hemisphere. For hippocampal groups, hippocampal damage was produced by 10 intra-cranial micro-injections of a solution containing the cellular neurotoxin NMDA (5 mg/1 phosphate buffer per site) into each hemisphere. The coordinates were: Anterior/Posterior: 3.1, 3.1, 4.1, 4.1, 5, 5, 5, 5.8, 5.8, 5.8; Lateral: +/- 1, 2.2, 2.2, 3.5, 3, 5.2, 5.2, 4.4, 5.1, 5.1; Ventral: 3.6, 3.6, 4.4, 4.4, 4.1, 5, 7.3, 4.4, 6.2, 7.5.

The solution was infused through 30-gauge stainless steel needles for 38 seconds, using a 10-1 syringe attached to a motorized infusion pump. The last two ventral hippocampal sites were injected for 2 min. each. The needles were removed 2 min. after each injection. Those rats that exhibited signs of seizure activity during surgical recovery were given injections of diazepam (10 mg/kg ip). In the procedure for control groups, incisions and burr holes were identical to the lesioned animals with the exception that there was no penetration of brain tissue. The schedule of hippocampal or control surgery across the RT, TO and PO conditions was determined by a semi-random schedule.

Following behavioural testing, rats with hippocampal lesions were deeply anesthetized with sodium pentobarbital and perfused with 0.9% saline followed by 10% formalin. The fixed brains were removed from the skull and stored in 10% formalin.
Brains were transferred to a 20% buffered sucrose solution 36 hours prior to sectioning. The brains were then frozen and sliced at 40 m. Every fifth section was mounted on gelled glass slides and stained with formal-thionin.

**General Training/Testing Procedures**

During training and testing periods, approximately equal numbers of rats were deprived of food or water for 23 hours. There were no differences between rats motivated to find either reward and, consequently, this variable was collapsed into a single reward condition. Training and testing trials consisted of placing the rats individually in the start area. On each trial, the rat was forced to enter the village through a different doorway. Because the rats were trained in groups of 5-6, a 5 to 8 min. interval separated the trials. When the rat found the reward compartment, it was allowed to eat or drink for 10 sec. At the end of each trial, the rat was returned to a holding cage where it awaited the next trial. At the end of each session, the rats were returned to their home cages, where they received food and water for one hour.

Errors were scored as described in the text. For example, if the rat entered the village facing due south with the reward compartment in the south-east corner (see Figure 1a) and turned due west (the rat’s right), an error would be counted. Every turn at subsequent choice points that took the animal in a direction away from the reward compartment counted as an additional error. Thus, for example, if the rat arrived at the south-west corner and turned north, that would be an error. Similarly, if the rat were in front of the south opening of the gathering area (facing north) and made a left hand turn, that would be counted as an error.

The amount of time required to reach the compartment on each trial was recorded in addition to the number of errors. Because the latency measures paralleled the error scores, they are not reported here but are available on request.
**Cue Distortion Condition**

In the cue distortion condition, a large testing apparatus and a desk that were part of the original environment were removed from the test room. In addition, several small pieces of furniture (e.g., chair, table) were relocated in the room. Other pieces (e.g., stool) and wall fixtures (e.g., light switch) remained in their original places. New furniture (e.g., bookcase) was brought in and replaced previous objects or occupied new places. There was a general reorganization of the original wall posters, with some retained in their original locations, others relocated, and yet others removed. A few new pictures were added to original and new locations. The village remained in its original location and orientation.

**Anosmia Condition**

In the anosmia condition, anosmia was induced by Alberts and Galef’s reflux method, whereby a 5% zinc sulphate solution (in physiological saline) was injected through a cannula inserted into the nasopharynx of the anesthetized rat. In the control procedure, physiological saline was administered in the same way. All rats received both procedures in counterbalanced order, separated by at least 2 weeks, and subsequently were tested on the village task. The effectiveness of the zinc sulphate to produce anosmia was tested in a food-finding task 24 hrs after treatment and 1 hr before village testing. In the food-finding task, zinc sulphate and saline treated rats were required to use olfactory cues to find and dig up 5 pieces of Froot-Loop cereal distributed in an open field (30 x 60 x 30 cm) and hidden beneath 5 cm of floor bedding. The rats received 3 trials per day. A trial was terminated when a rat found all 5 Froot-Loop pieces or after 300 sec. had elapsed. Over 5 days of testing, zinc sulphate-treated rats found fewer Froot-Loop pieces (mean = 1.25/day) than saline-treated rats (mean = 4.94/day), and took longer (zinc-sulphate-treated
– 279.65 sec./trial vs. saline-treated – 93.01 sec./trial). There were no differences between hippocampal and control rats in either treatment condition.

**Radial Arm Maze**

The radial arm maze test was conducted in a standard radial maze consisting of a central circular platform (35 cm. in diameter) and 8 arms (85 x 7 cm.), extending in all directions. The entire apparatus was elevated 120 cm. off the floor. Rats were familiarized with the apparatus according to procedures followed in our lab and described previously. Rats then received a daily test trial over 10 consecutive days. During testing, each food cup was baited with a single piece of Froot-Loop cereal. The rat was placed on the center platform and allowed to locate and consume each piece. The trial was terminated when all the Froot-Loop cereal was eaten, or 10 min. had elapsed. An error was counted when a rat placed all four feet in an arm in which the Froot-Loop piece had been eaten.

**References**


