Supporting Information

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SI Results

Left Hippocampus. Fig. S1 shows QQ plots from the left hippocampus broken down by correct and incorrect behavioral responses. The pattern is suggestive of bimodality regardless of the accuracy of the behavioral response. Fig. S2 shows QQ plots from the left hippocampus broken down by lag. The left column shows the results when 100% of recordings are included in the analysis, and the right column shows the results when the highest 2.5% of recordings for novel items and repeated items are excluded from the analysis. A pattern consistent with sparse distributed coding is evident across most of the lags with the exceptions of 8 and 16. In all cases, the QQ plot pattern is essentially linear when the highest 2.5% of the scores are eliminated from the analysis (as shown by the QQ plots in the right column).

Left Amygdala. As noted earlier, a general novelty signal in the left amygdala was strong enough to be convincingly detected at the level of individual single units (Table 1). How does that effect manifest itself in the full novel- and repeated-item distributions of single-unit recordings made from the amygdala? The mean and SD scores computed from the full distributions were both significantly greater for novel items compared with repeated items in the left amygdala but not in the right amygdala (Table S1). Again, the fact that these effects are observed in the left but not right amygdala may be attributable to the fact that a verbal memory task was used in our experiment. This overall novelty signal in the left amygdala is consistent with the fact that 25 single units were identified in the left amygdala that were general novelty detectors (i.e., they responded significantly more, on average, to novel items than to repeated items). The fact that a subset of single units were novelty detectors would account for both the mean and SD differences in the full distributions in the left amygdala (Table S1).

The QQ plots for recordings made from the left and right amygdala (Fig. S3 *A* and *B*, respectively) both show slight evidence of novelty detection at the very high end of each plot. However, visual appearances notwithstanding, the number of points that fall visibly below the diagonal line toward the upper end is extremely small (~0.1% of all points). These points did not have an appreciable effect on either the means or the SDs shown in Table S1, both because there were so few and because the degree to which they deviated from the diagonal line was relatively small. In fact, when 2.5% of the highest scores are eliminated (thereby eliminating all of the points diverging below the diagonal line and more), the statistical pattern of results does not change. In other words, whether 100% of the data are considered or 97.5% of the data are considered (Table S1), a significant difference is evident for novel and repeated items—for both the mean and SD—in the left amygdala but not in the right amygdala. In fact, those differences remain significant even when 20% of the highest values are removed from the analysis. Thus, the results suggest a general pattern of novelty detection.

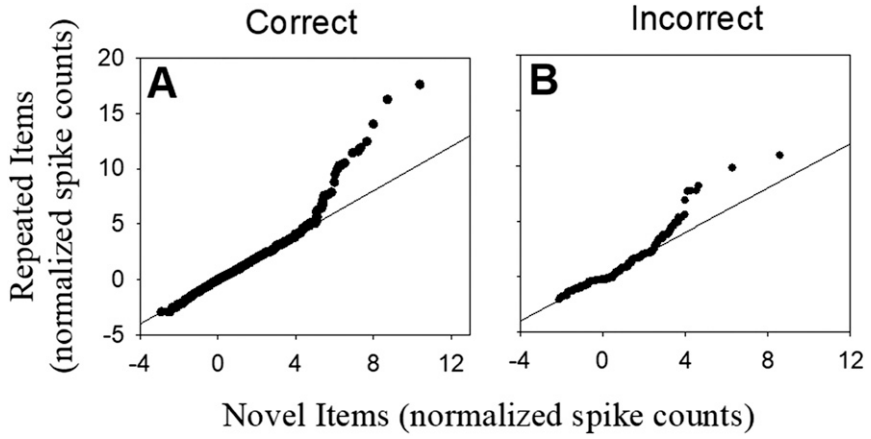

Fig. S1. QQ plots for left hippocampus for correct behavioral (*A*) and incorrect behavioral (*B*) decisions. Correct behavioral decisions consist of hits and correct rejections, and incorrect behavioral decisions consist of misses and false alarms. Each point on a QQ plot represents the normalized average spike count recorded on a single test trial. The plot displays those values aggregated across trials and patients. For correct decisions, the plot displays 10,695 and 11,163 normalized spike counts for hits and correct rejections, respectively. For incorrect decisions, the plot displays 2,159 and 2,659 normalized spike counts for hits and correct rejections, respectively.

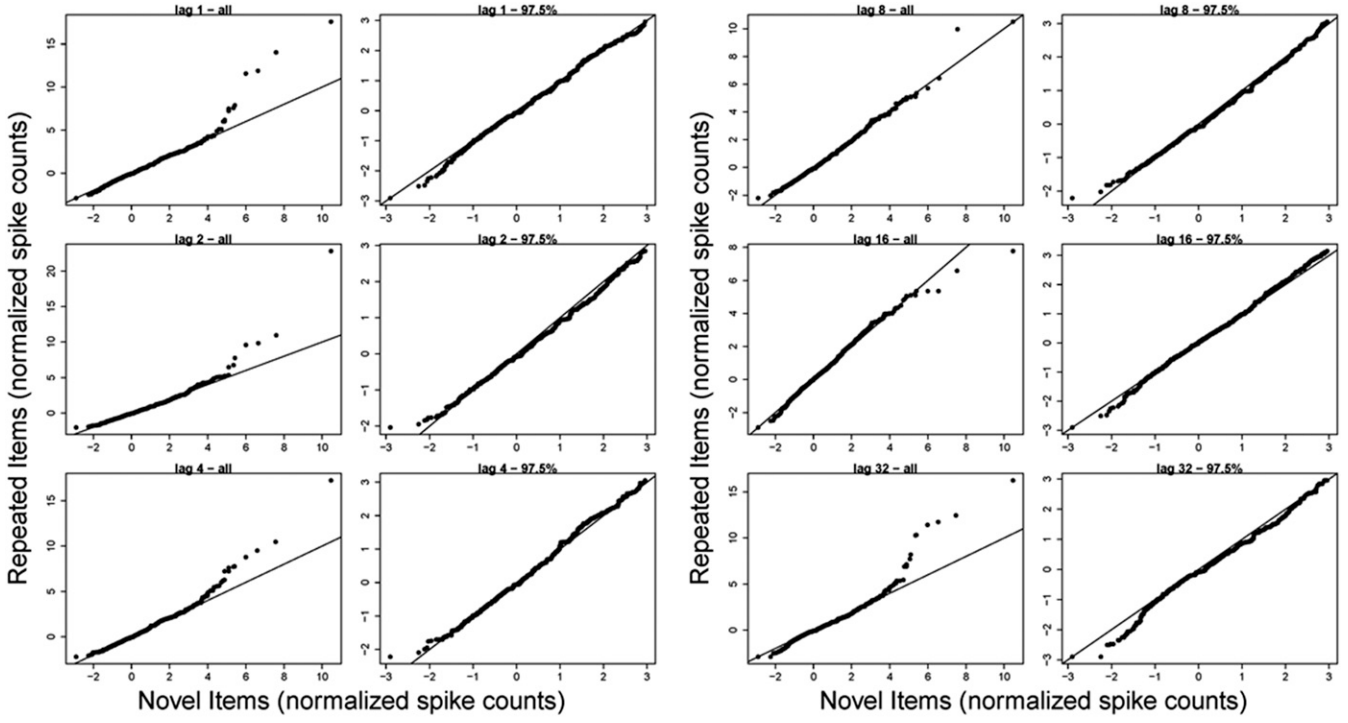

Fig. S2. QQ plots for left hippocampus for 100% of the data (*Left*) and after excluding 2.5% of the data with the highest spike counts from both the repeated-item and novel-item distributions (*Right*) separately for each lag.

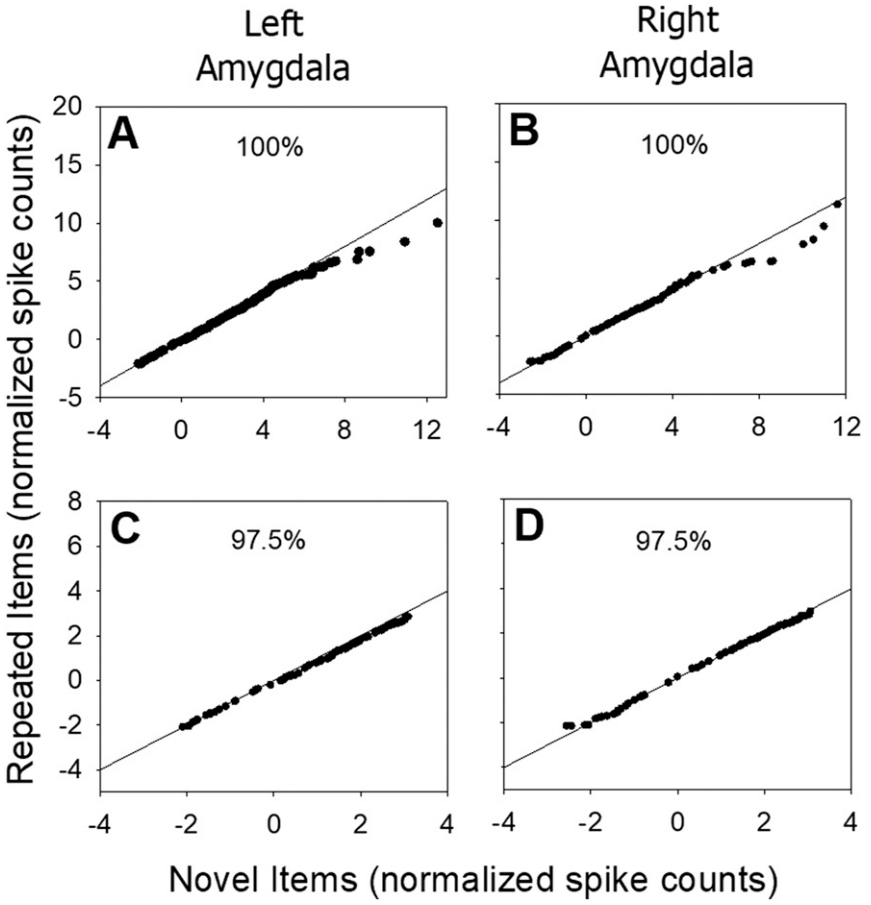

Fig. S3. QQ plots for the left and right amygdala for 100% of the data (*A* and *B*, respectively) and after excluding the upper 2.5% of the data (*C* and *D*, respectively). In the left amygdala, the 100% plot displays 15,121 and 16,191 normalized spike counts for repeated and novel items, respectively. In the right hippocampus, the corresponding values are 10,153 and 11,379 normalized spike counts.

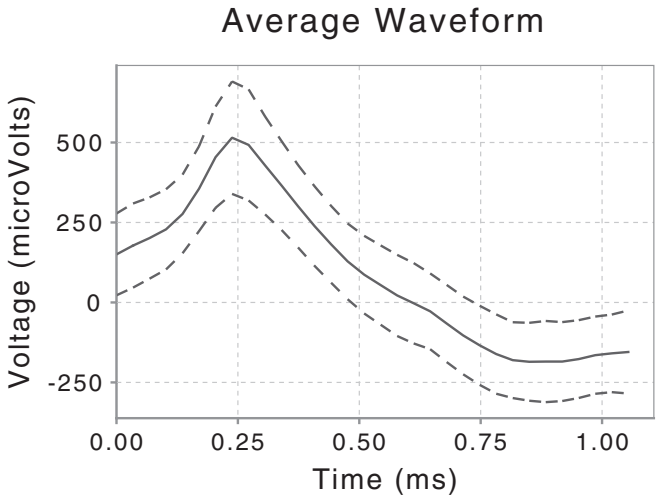

Fig. S4. Waveform shape of single-unit activity recorded in the left hippocampus. *x* axis: Time during waveform in milliseconds, with peak centered at 0.25 ms. *y* axis: Extracellular potential difference in microvolts; solid line shows the average value of all possible action potential events in the cluster, dotted lines show ±1 SD.

Table S1. Distributional statistics (mean and SD) for recordings made from left and right amygdala

		Left			Right		
Data analyzed, %	Statistic	Repeated	Novel	adj *P*	Repeated	Novel	adj *P*
100	Mean	0.09	0.19	<0.001	0.01	0.00	0.686
	SD	1.08	1.15	<0.001	1.00	1.01	0.686
	n	15,121	16,191	—	10,153	11,379	—
97.5	Mean	−0.01	0.08	<0.001	−0.10	−0.11	0.609
	SD	0.88	0.95	<0.001	0.74	0.74	0.814
	n	14,742	15,786	—	9,899	11,094	—

Mean, SD, and number of normalized spike counts (*n*) associated with the distributions for repeated and novel items in the left and right amygdala (aggregated over all recorded units and trials) for 100% of the data (top 3 rows) and after excluding the highest 2.5% of the scores for each distribution, thereby retaining 97.5% of the data (bottom 3 rows).