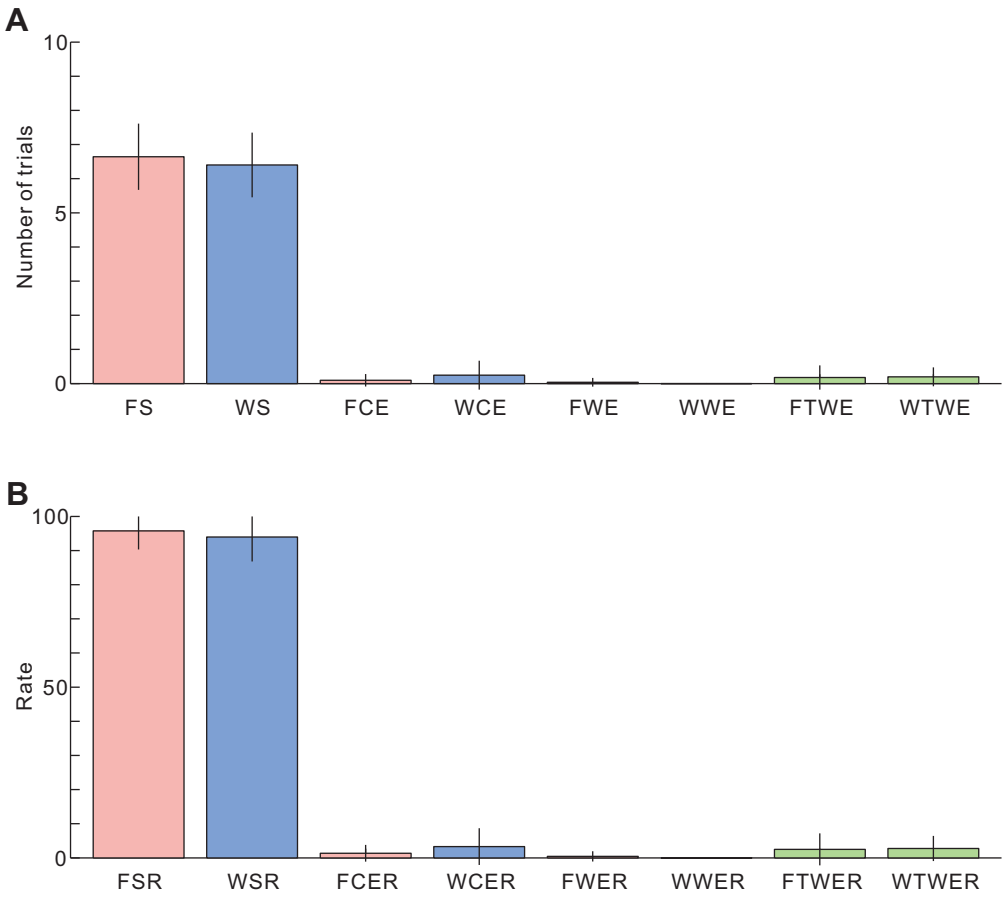
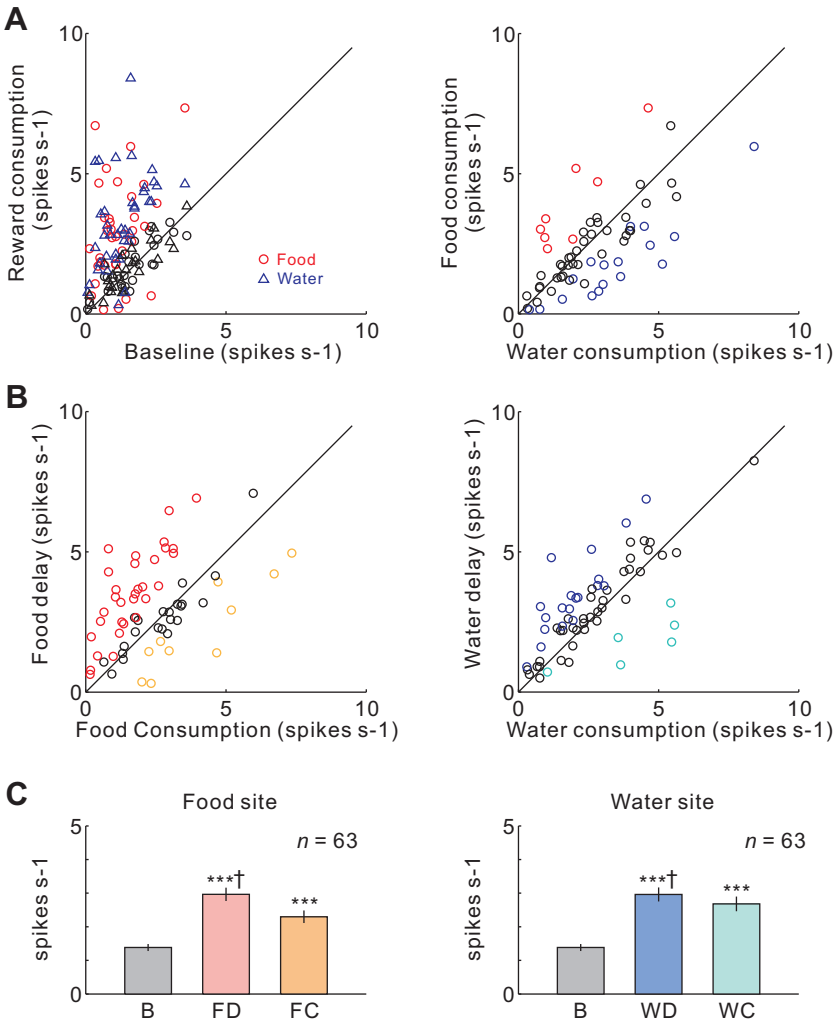
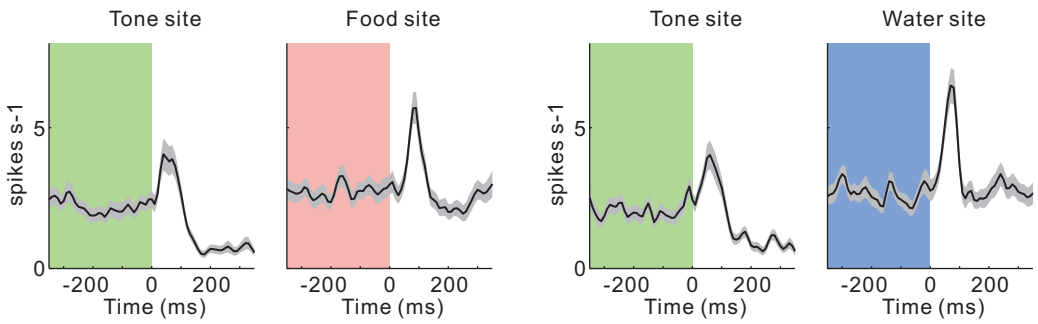


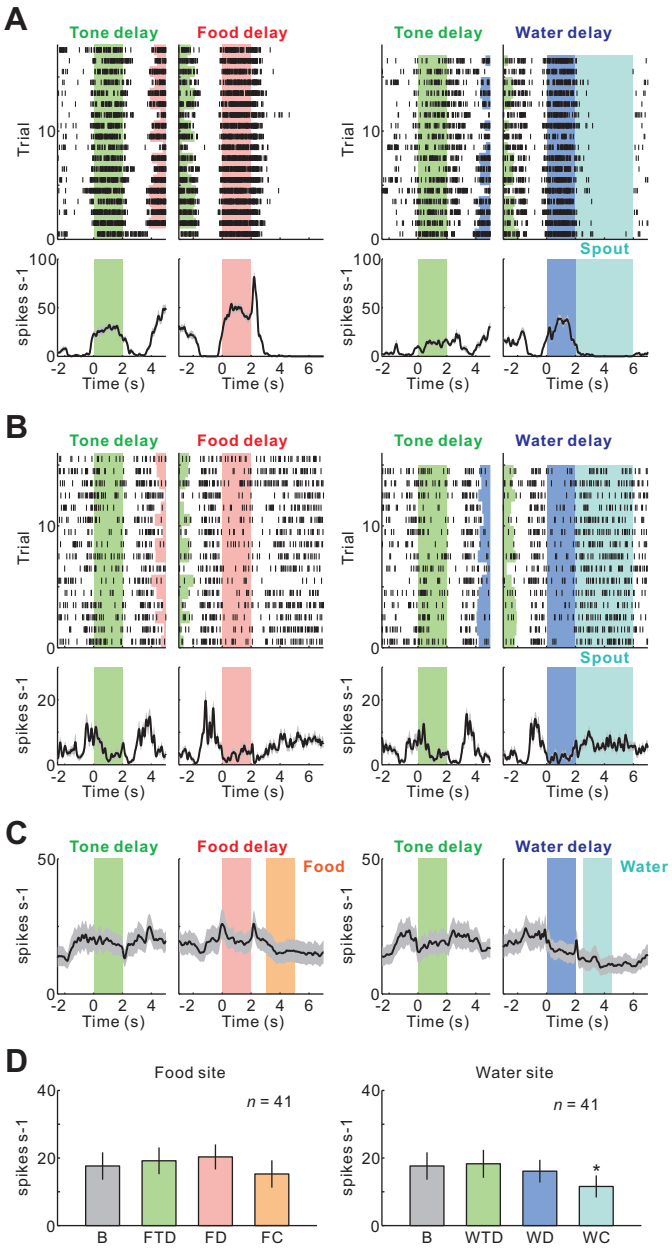
Supplemental Figure S1. Rats' performance under the constant delay condition. ***A***, Number of reward successes (food successes (FS) and water successes (WS)), reward choice errors (food choice errors (FCE) and water choice errors (WCE)), reward wait errors (food wait errors (FWE) and water wait errors (WWE)), and tone wait errors (food tone wait errors (TWEF) and water tone wait errors (TWEW)) for a period of 5 min during the constant delay (CD) condition. Under the CD condition, the number of reward choice errors, reward wait errors, and tone wait errors is very small. ***B***, Reward success rate (food success rate (FSR) and water success rate (WSR)), reward choice error rate (food choice error rate (FCER) and water choice error rate (WCER)), reward wait error rate (food wait error rate (FWER) and water wait error rate (WWER)), and tone wait error rate (food tone wait error rate (FTWER) and food tone wait error rate (WTWER)) during the CD condition. Data from three rats are plotted as mean ± SD.



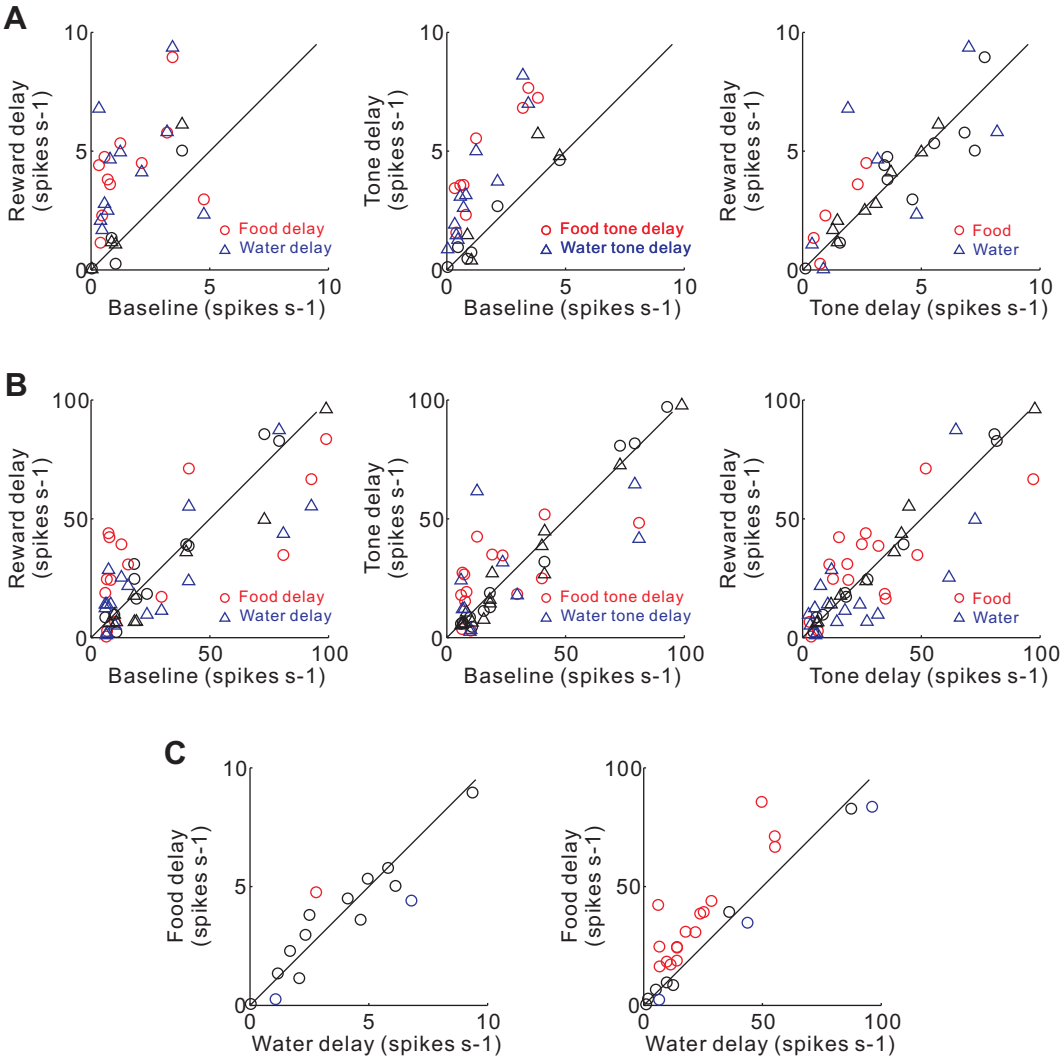
Supplemental Figure S2. Comparison between baseline activity and reward consumption activity in DRN serotonin neurons. ***A***, Scatter plot of baseline activity versus reward consumption activity (left) and Water versus food consumption activity (right) in DRN neurons (*n* = 63). Left: Open circles and open triangles indicate food and water consumption activity, respectively. Left and right: Red and blue represent activity in which the difference in firing rate was statistically significant (Mann-Whitney U-test, $p < 0.01$). Black, no significant difference. ***B***, Scatter plot of reward consumption versus reward delay activity (left, food; right, water) in DRN neurons (*n* = 63). Left: Red and orange indicate neurons with statistically significant higher food delay and food consumption responses, respectively (Mann-Whitney U-test, $p < 0.01$). Right: Blue and light blue indicate neurons with statistically significant higher water delay and water consumption responses, respectively (Mann-Whitney U-test, $p < 0.01$). ***C***, Averaged firing rates during baseline (B), food delay (FD), water delay (WD), food consumption (FC), and water consumption (WC) are shown. Asterisks (***) indicate significant differences compared with baseline activity (Wilcoxon signed-rank test, $p < 0.0001$). Cross marks (†) indicate significant differences compared with reward consumption activity, (Wilcoxon signed-rank test, $p < 0.005$).



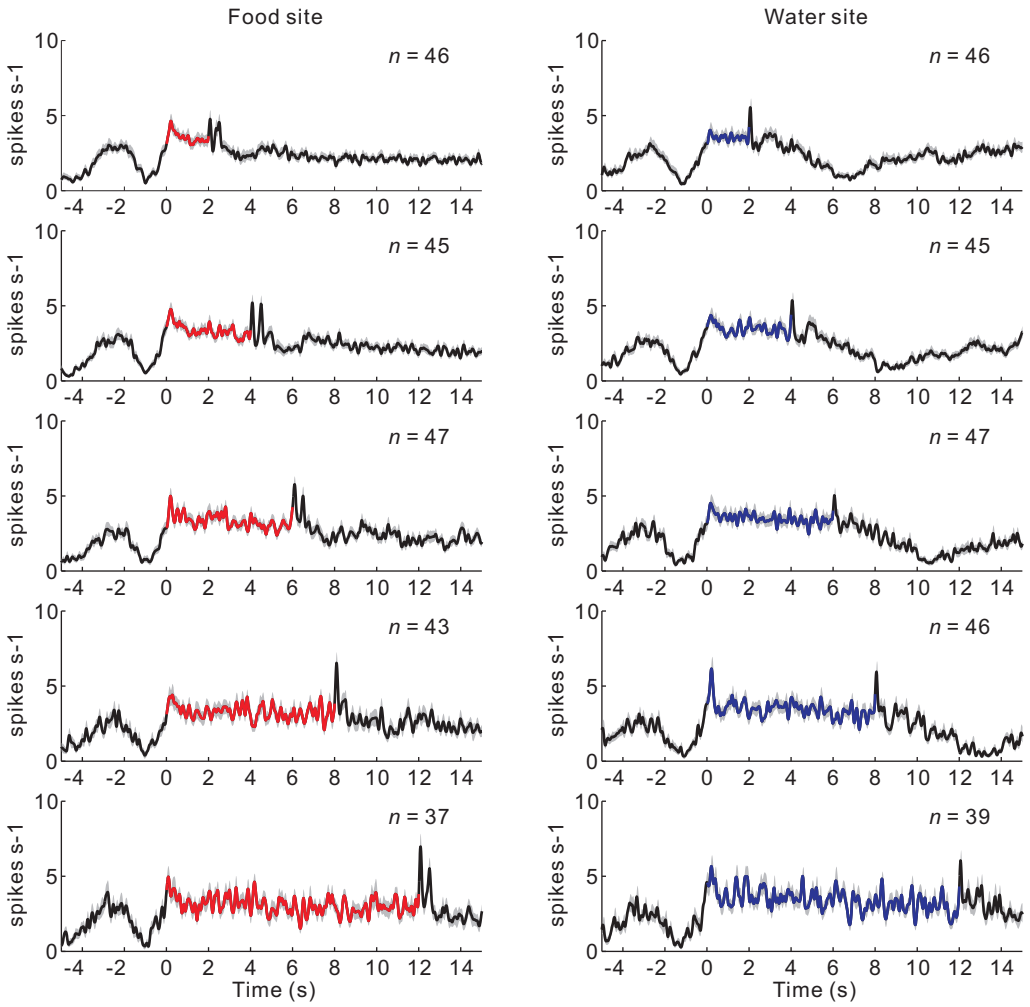
Supplemental Figure S3. Responses of serotonin neurons to onsets of tone, food magazine, and electromagnetic motor for spout. Averaged activity of sixty-three 5-HT neurons during the CD condition aligned to onsets of food tone (left), food magazine (middle left), water tone (middle right), and the electromagnetic motor for the water spout (right). Averaged activity is smoothed with a Gaussian filter (SD = 10 ms). Green, red and blue areas indicate tone delay, food delay and water delay periods, respectively. Gray shadings indicate SEM.



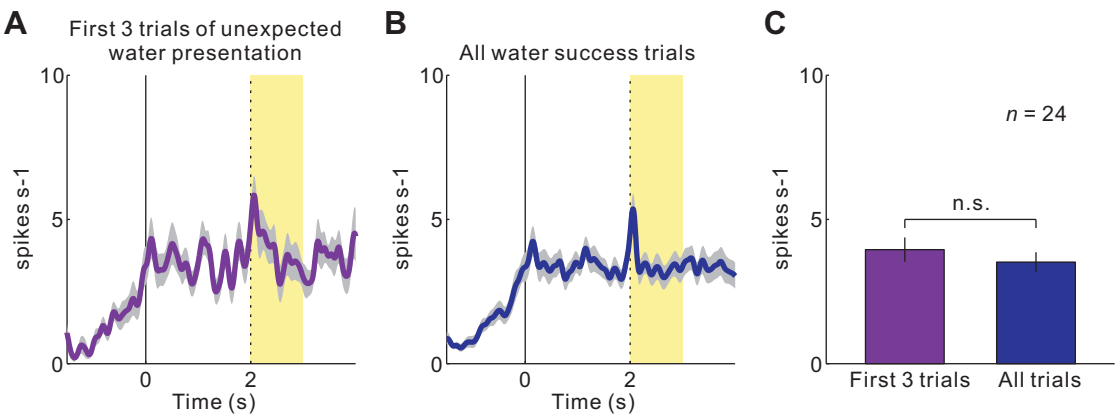
Supplemental Figure S4. Activity of the DRN non-serotonin neurons under the constant delay condition. ***A***, ***B***, Activity of two example putative non-5-HT neurons. Green, red and blue areas indicate tone delay, food delay and water delay periods, respectively. Light blue areas indicate water spout presenting period. ***C***, Averaged activity of the 41 neurons during the CD condition. Orange and light blue areas indicate the periods that were used to analyze food and water consumption responses, respectively. ***D***, Averaged firing rates during the baseline (B), food tone delay (FTD), water tone delay (WTD), food delay (FD), water delay (WD), food consumption (FC), and water consumption (WC) are shown. Asterisks (*) indicate significant differences compared with baseline activity (Wilcoxon signed-rank test, $p < 0.05$). In ***A***, ***B*** and ***C***, gray shadings indicate SEM.



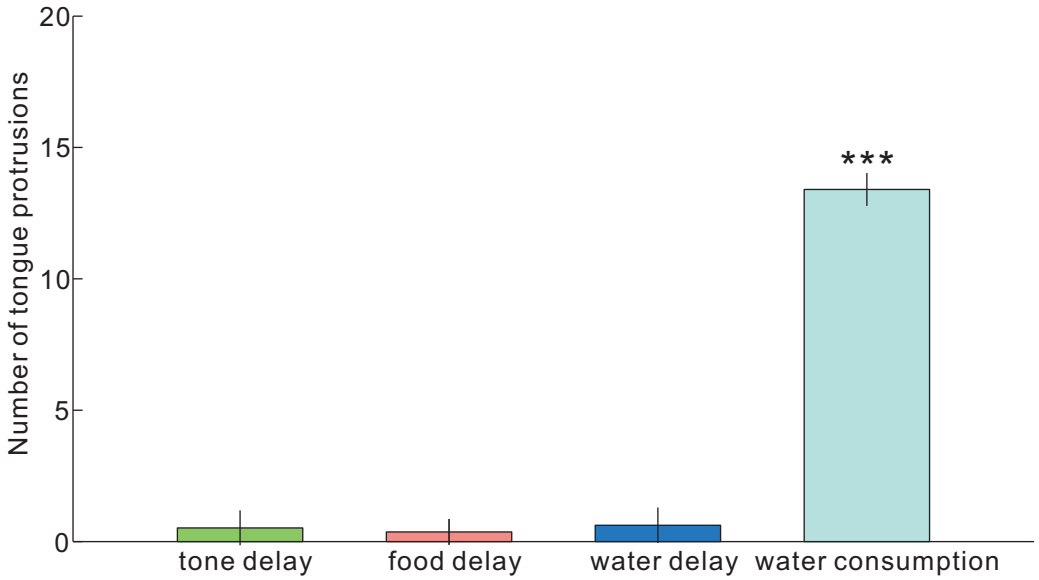
Supplemental Figure S5. Firing properties of putative non-5-HT DRN neurons. ***A***, Scatter plot of baseline activity versus reward delay activity (left), baseline versus tone delay (middle), and tone delay versus reward delay activity (right) in low baseline firing (< 5 Hz) non-5-HT neurons (n = 15). Open circles and open triangles indicate food related and water related activity, respectively. Red and blue represent activity in which the difference in firing rate was statistically significant (Mann-Whitney U-test, $p < 0.01$). Black, no significant difference. ***B***, Scatter plot of baseline activity versus reward delay activity (left), baseline versus tone delay (middle), and tone delay versus reward delay activity (right) in high baseline firing (> 5 Hz) non-5-HT neurons (n = 26). ***C***, Comparison between water delay activity and food delay activity in low baseline firing (left) and high baseline firing (right) non-5-HT neurons. Red and blue indicate neurons with statistically significant higher food and water delay responses, respectively (Mann-Whitney U-test, $p < 0.01$).



Supplemental Figure S6. Population activity of DRN serotonin neurons under the extended reward delay condition. Averaged activity of serotonin neurons aligned to the time of entry into the food site (left) and the water site (right) during the ERD condition. Red and blue lines indicate activity during the food delay and water delay periods, respectively. To make population histograms, neural activities between 1 s and 2 s from reward site entry are sorted from 3-s, 5-s, 7-s, and 9-s delay activities; and then 3-s, 5-s, 7-s, and 9-s delay activities are merged with 2-s, 4-s, 6-s, and 8-s delay activities, respectively. Gray shadings indicate SEM. Food site: 2-s delay (*n* = 46), 4-s delay (*n* = 45), 6-s delay (*n* = 47), 8-s delay (*n* = 43), and 12-s delay (*n* = 37). Water site: 2-s delay (*n* = 46), 4-s delay (*n* = 45), 6-s delay (*n* = 47), 8-s delay (*n* = 46), and 12-s delay (*n* = 39).



Supplemental Figure S7. Effect on unexpected water presentation on serotonin neural activity. ***A***, Population activity of the first three trials after the changes of reward condition from WO condition to CD condition aligned to water site rewarded entry (*n* = 24). Gray shading represent SEM. Dotted line at 2 s indicates the time of water spout presentation. Light yellow area indicates the period that was used to average firing rate. ***B***, Population activity of all water success trials during CD condition excluding ***A*** aligned to water site rewarded entry (*n* = 24). ***C***, Average firing rate for 1 sec after water spout presentation (*n* = 24). (left, first 3 trials after the changes of reward condition from WO condition to CD condition; right, all water success trials under the CD condition excluding the first 3 trials; *n* = 24; ± SEM). n.s., not significant.



Supplemental Figure S8. Number of tongue protrusions during tone delay, reward delay, and water consumption. Three rats were newly trained the food-water navigation task and rats' mouth movement were examined during the CD condition (tone delay, reward delay, and water consumption were 2 s). The number of tongue protrusions during water consumption was significantly larger than that of during other delay periods (Tukey's HSD test, ***$p < 0.0001$). Data from three rats are plotted as mean ± SD.