Figure 1b. For example, activation of presynaptic input fibers arising from the caudate nucleus might be activated along with the SNr output fibers. If this happened, we might expect the electrical stimulation to inactivate the SNr by increasing local inhibition. Thus, the effects of SNr stimulation may reflect a mixture of activation and inactivation of SNr activity. Based on our finding that saccades were suppressed, we think that while there may be mixed local effects of stimulation, the effects on behavior result from activation of the output pathway. That the suppression was not often as profound as we anticipated may reflect these mixed effects or may reflect a depletion of neurotransmitter resulting from long stimulation trains. Interestingly, the initial experiments often did show profound effects on saccade occurrence that waned with repeated experiments. Similar reductions in the efficacy of stimulation were reported in dorsal premotor cortex (Churchland and Shenoy 2007). Therefore another possibility is that the reduced effects and decline in efficacy of SNr stimulation result from active compensation or tissue damage. Sorting this out will require further experiments.

Nevertheless, across the sample of 61 sites, SNr stimulation did alter saccades when they were produced. Both the direction and the amplitude of the saccade vector were altered. The alteration in vectors was more prominent for memory-guided saccades than for visually-guided saccades. This is consistent with the hypothesis that the SNr plays a preferential role in non-visually guided movements (Hikosaka and Wurtz 1983c; Wichmann and Kliem 2004b). However, in contrast to the previous recording results, other recordings of SNr neurons during saccades showed little difference between the activity of SNr neurons