Sensation involves active movement of sensory organs, but it remains unknown how position or movement of sensory organs is encoded in cortex. In the rat whisker system, each whisker is represented by an individual cortical (barrel) column. Here, we quantified in awake, head-fixed rats the impact of natural whisker movements on action potential frequencies of single (identified) neurons located in different layers of somatosensory (barrel) cortex. In all layers, we found only weak correlations between spiking and whisker position or velocity. Conversely, whisking significantly increased spiking rate in a subset of neurons located preferentially in layer 5A. This finding suggests that whisker movement could be encoded by population responses of neurons within all layers and by single slender-tufted pyramids in layer 5A.