Figure 4. Change in sound modulation index during running laser on trials can be well predicted by the sum of the running and VIP activation effects computed separately.

**A.** Running effect on sound modulation index plotted against VIP activation effect on sound modulation index for each neuron. The effect of running and activation VIP neurons do not correlated in the population of recorded cells (rho = ##, p = ##). **B.** Combined change in sound modulation during running and VIP activation plotted against predicted change in sound modulation index computed on running and VIP activation effect separately, showing strong correlation (rho = ##, p =##). Observed change in sound modulation during running laser on trials can be well predicted by summing effects of running and VIP activation alone, suggesting that the effects of VIP activation and running do not interact.

Sound MI sit laser off  = (response sit laser off - spont sit laser off) / (response sit laser off + spont sit laser off)

Sound MI run laser off = (response run laser off - spont run laser off) / (response run laser off + spont run laser off)

Sound MI sit laser on  = (response sit laser on - spont sit laser on) / (response sit laser on + spont sit laser on)

Sound MI run laser on = (response run laser on- spont run laser on) / (response run laser on + spont run laser on)

Running Effect = Sound MI run laser off - Sound MI sit laser off

Laser Effect = Sound MI sit laser on - Sound MI sit laser off

Combined Effect  = Sound MI run laser on - Sound MI sit laser off

Predicted combined Effect = Running Effect + Laser Effect