Supporting Information for
The Origin of Behavioral Bursts in Decision-Making Circuitry

Supporting Material and Methods

(a) The mean IAI is directly proportional to the scale parameter *λ*

The *n*-th moment of the Weibull distribution is of the form [1]

$$\lambda^n \Gamma(1+n/k)\,. \tag{S1}$$

Thus the mean is given by

$$m = \lambda \Gamma(1+1/k)\,, \tag{S2}$$

that is linearly proportional to the parameter *λ*, as we wanted to show.
The dependence with the shape parameter *k* is through the gamma function. To get insight on this dependence consider the following approximation in the interval 0.2<*k*<1, $\Gamma(1+1/k) \approx 0.25\ Exp[1.0757/k]$, that is, the mean increases exponentially with the inverse of the shape parameter *k* in the region of *k* of experimental interest to us, 0.2<*k*<1.

(b) The burstiness parameter *B*, when applied to the Weibull distribution, is independent of the scale parameter

Substituting Eq. (S1) for *n*=1,2 into Eq. (2), we obtain,

$$B = \frac{\left(\Gamma(1+2/k) - \Gamma^2(1+1/k)\right)^{1/2} - \Gamma(1+1/k)}{\left(\Gamma(1+2/k) - \Gamma^2(1+1/k)\right)^{1/2} + \Gamma(1+1/k)}, \tag{S3}$$

that only depends on the shape parameter *k*. To get some intuition, we note that for the interval of *k* of interest in this paper, 0.2<*k*<1, burstiness can be roughly approximated by $B \approx 1.27 - 2.26k + 1.02k^2$, that is a function that decreases monotonically with *k*.

Supporting References

1. Johnson NL, Kotz S, Balakrishnan N (1994) Continuous Univariate Distributions, Vol.1. Wiley Series in Probability and Statistics.