Review of: "Depolarization block of interneurons"

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Potential competing interests: No potential competing interests to declare.

This is a nice short study in which the authors explore firing properties in a computational H&H model of a fast spiking interneuron. They show that this model shows a depolarization block (no more action potential firing with strong input current) and that inhibitory synaptic inputs can provide a way to release this block.

The study is well executed. The novelty of this study is limited, as depolarization block is a well known physiological phenomenon.

I have several comments, which the authors may find helpful:

page 2:"It is a phenomenon different from the usual Hopf bifurcation where the amplitudes of the oscillations of the potentials goes to zero for an increasing current." The authors cannot assume that readers know what is meant by "the ususal Hopf bifurcation". Please clarify.

page 2: "of the activity of an interneuron due to a sustained excitation could blow up the complex mechanism of memory formation which strongly relies on their
functioning" It is not clear to me what the authors mean here. Could you please rephrase?

page 3; " a basket interneuron" I am assuming the authors mean a fast-spiking, presumably parvalbumin-positive basket cell? There are also CCK/CB1 positive basket cells that fire at lower rate. It is important to be as clear as possible here.

table 1: reversal potential for Na seems unphysiological low. In neurons, ENa would be more clode +55 mV. Is this perhaps a typo? If not - does any of the conclusions change if ENa = +55mV?

page 4: what is meant by "Vpre is involved..." - are you assuming a sigmodial depolarization of the presynaptic terminal?

page 5: with such small variance the firing can hardly be considered a stochastic process

table 3: decay time constant of IPSCs is normally larger ~20-30 ms. Do the conclusions change if IPSC decay is made longer?

page 6: it would be nice to briefly introduce the concept of bifurcation to the reader. Describe how you constructed figure 1.

page : please explain what is meant by "a saddle node bifurcation on invariant circle". You have not introduced the concept "invariant circle" to the reader.

please show that the location is on the invariant circle, as that seems an important observation.

figure 3: the colors red are almost indistinguishable.

page 8: When cells are in depolarization block, recovery from inhibition can trigger AP firing. To me, this does not seem too surprising. I am sure previous studies have described this already.

page 8: the authors explain one of their main findings by the neuron acting as a resonator. They need to explain what they mean by this. They cannot get away by referring to another study.

page 9: did the authors carefully check if depolarization block in FS interneurons has not been observed before in experimental studies? These studies should be discussed here.

page 10: I encourage the authors to search for experimental studies in which this disinhibitory effect of inhibitory input was observed. It would strengthen the current work and perhaps gives clues about follow up studies.