Increasing excitability of motor neurons at the *Drosophila* Neuromuscular Junction to examine functional plasticity

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**Abstract**

The Drosophila neuromuscular junction (NMJ) consists of two different motor neurons, which can compensate for stressors in the other motor neuron. This phenomenon is known as heterosynaptic plasticity. In this experiment, we overexpressed the glutamate transporter vGlut in individual motor neurons to examine functional plasticity. Overexpression of the gene vGlut increases the amount of glutamate in the synapse. We hypothesized that increasing excitability in one of the motor neurons will result in compensation of the unaffected motor neuron. Flies with vGlut overexpression in Is neurons had lower amplitude than baseline transmission (wildtype) and 1b vGlut overexpression amplitude was slightly lower than baseline transmission. There is functional plasticity with 1b vGlut overexpression, but the amplitude of Is > vGlut mimicked those of complete ablation.

**Results**

These results show that there is probably some natural plasticity when overexpressing vGlut in 1b motor neurons. However, the amplitude of Is > vGlut flies was much lower than baseline transmission, mimicking the amplitude of ablation. These results were a blended phenotype, so in the future one would need to silence the other motor neuron.

**Conclusion**

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**Acknowledgements**

Thank you to Joshua Martinez for training and mentoring me, Dr. Dion Dickman for allowing me to do research and the Bridge Institute for providing funding.

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**Figure 1.** Is motor neuron at the *Drosophila* neuromuscular junction (NMJ) expressing a transmembrane green fluorescent protein (GFP).

**Figure 2.** Representative traces of EPSPs and mEPSPs from Is > vGlut and 1b > vGlut compared to baseline transmission.

**Figure 3.** Overexpression of vGlut in Is motor neurons significantly decreased the evoked (p=0.00046, unpaired t-test) and mini amplitude (p = 0.049, unpaired t-test). There was no significance in evoked and mini amplitude in Ib motor neurons compared to baseline transmission.

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**References**


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**Methods**

*Drosophila* is the premier genetic model organism

**Electrophysiology at the Drosophila NMJ**

**Quantification**

- **Excitatory Postsynaptic Potential (EPSP)**
- **Mini Excitatory Postsynaptic Potential (mEPSP)**