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Supplementary Materials for

Optogenetic pacing in *Drosophila melanogaster*

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This PDF file includes:

Other Supplementary Material for this manuscript includes the following:
(available at advances.sciencemag.org/cgi/content/full/1/9/e1500639/DC1)

Supplementary Materials

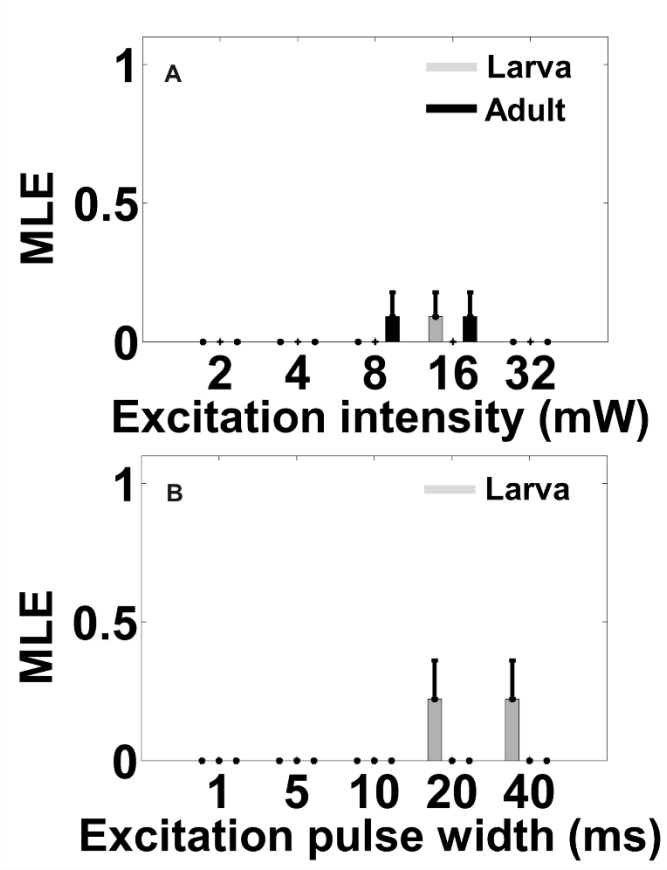

Fig. S1. Cardiac stimulation of control flies (24B-GAL4/+) at different developmental stages. Maximum likelihood estimate (MLE) for successful pacing was estimated at different **(A)** stimulation power levels and **(B)** pulse widths at different developmental stages (n=10 at each stage). Optical stimulations alone have very minimal influence on the heart rate of the control flies at all stages. Only a very small percentage of the control flies responded to the stimulation pulses in larva and adult flies when the stimulation power was about 16 mW. Likewise, a small percentage of control larvae responded to 20 ms and 40 ms stimulation pulses. Results are shown as mean ± SEM.

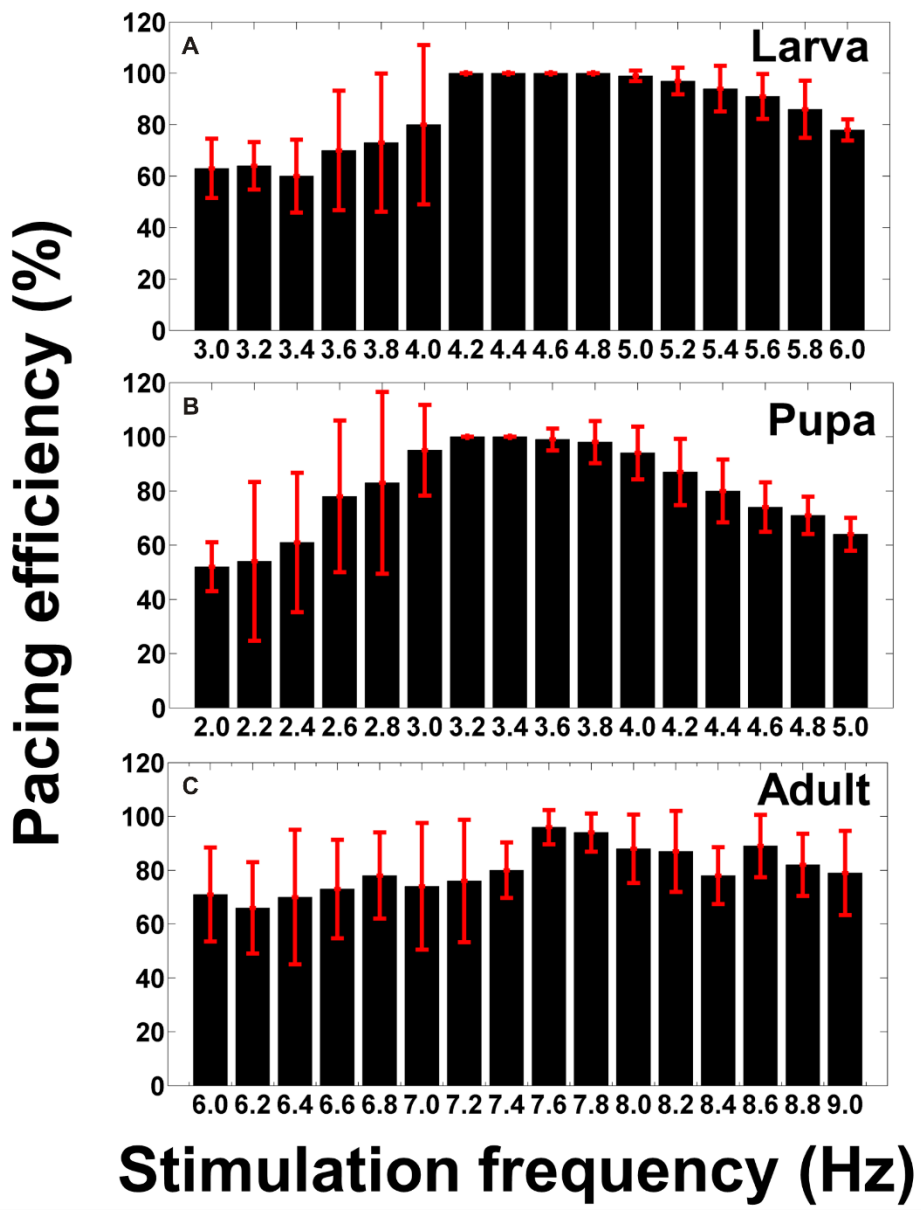

Fig. S2. Estimation of PE at different pacing frequencies. PE at **(A)** larva, **(B)** early pupa and **(C)** adult stages. PE is the ratio between number of pacing pulses that resulted in a heart contraction and the total number of pulses. As expected, PE values were lower at extreme stimulation frequencies. Results are shown as mean ± SD.

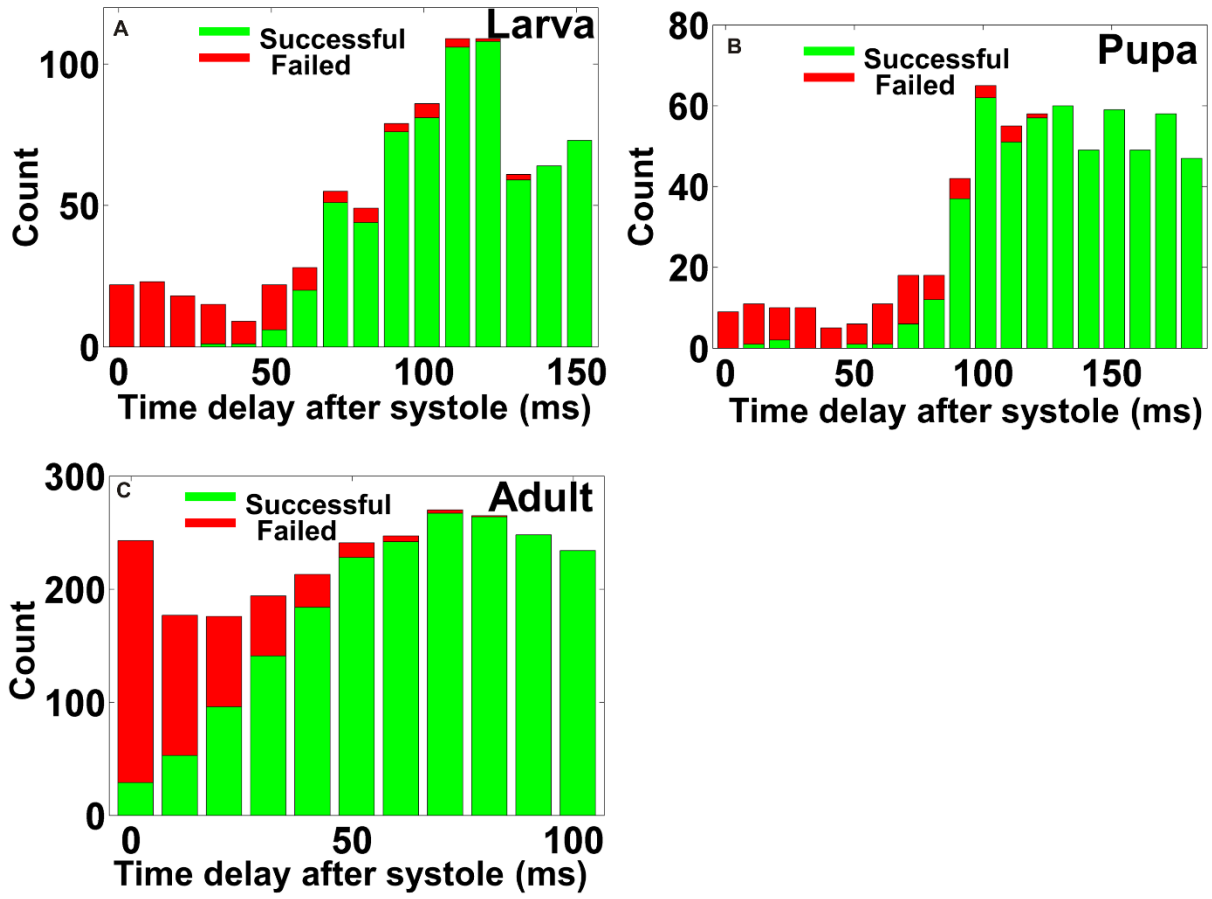

Fig. S3. Histogram analysis of RP at different developmental stages. Histograms showing the effectiveness of pacing pulse at different time delays with respect to previous completed systole at **(A)** larva, **(B)** early pupa and **(C)** adult stages.

Video S1. Tuning the HR of a *Drosophila* larva at 4, 5, and 6 Hz. The RHR of this larva was 4 Hz. The total duration of the video is 12 s and the video playback speed has been reduced by a factor of 6 for demonstration purposes.

Video S2. Tuning the HR of a *Drosophila* early pupa at 3, 3.5, and 4 Hz. The RHR of this early pupa was 2.5 Hz. The total duration of the video is 12 s and the video playback speed has been reduced by a factor of 6 for demonstration purposes.

Video S3. Tuning the HR of an adult *Drosophila* at 8, 9, and 10 Hz. The RHR of this adult fly was 6 Hz. The total duration of the video is 12 s and the video playback speed has been reduced by a factor of 6 for demonstration purposes.