# Supplementary material

## Indirect actuation reduces flight power requirements in *Manduca sexta* via elastic energy exchange

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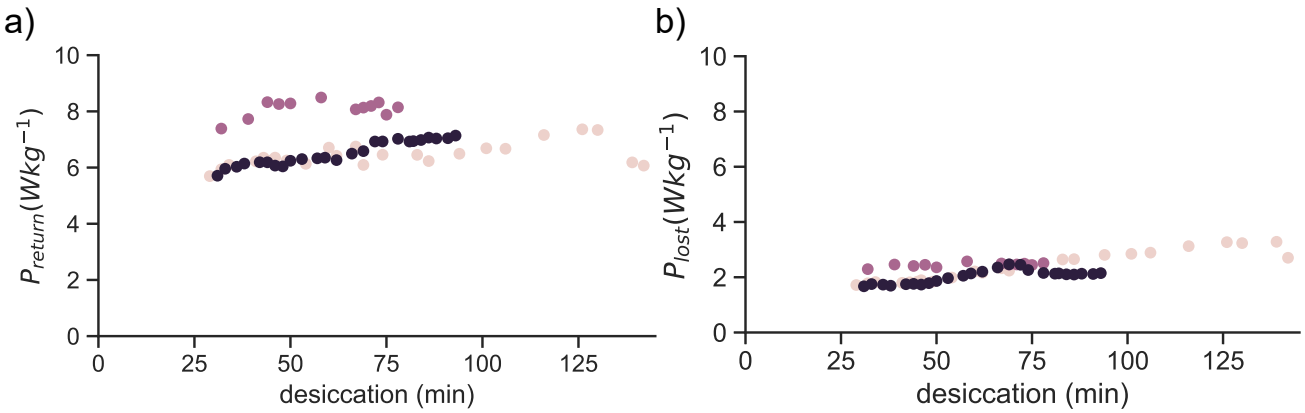


Figure S1: Desiccation experiments. We performed dynamic mechanical testing on thoraxes with passive musculature 26 to 142 minutes after thorax extraction. Colors denote individual thoraxes a) $P_{return}$ vs desiccation time. b) $P_{lost}$ vs desiccation time. Both $P_{return}$ and $P_{lost}$ increase with time, but the conclusions in this manuscript hold true regardless of desiccation effects

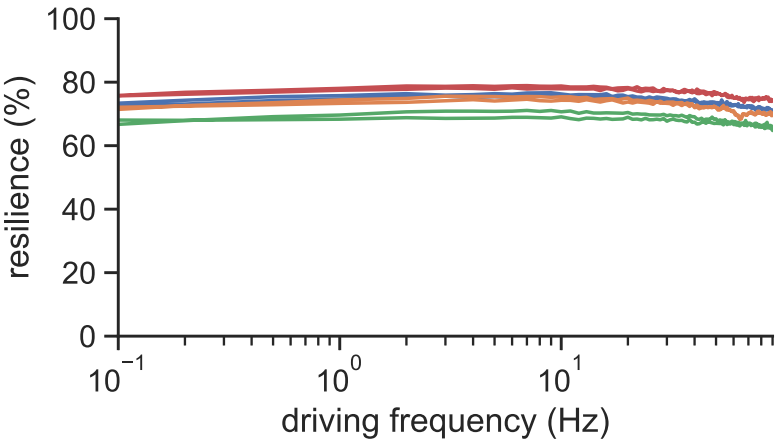


Figure S2: Reverse sweep experiments. We performed dynamic mechanical testing on thoraxes with removed musculature sweeping from 0.1 to 90 Hz followed immediately by a sweep from 90 to 0.1 Hz. Each color denotes resilience of an individual thorax. We see no differences in resilience as a function of sweep direction.

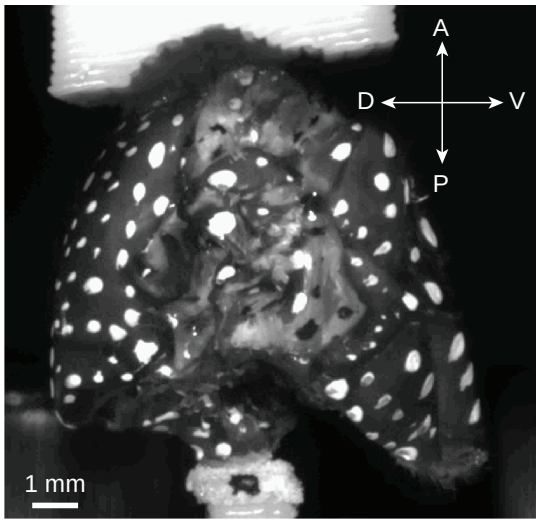


Figure S3: Mediolateral view of second thoracic segment deformed at 1 Hz, recorded at 200 fps, and slowed 10x. Anterior is towards the top of the video and dorsal is towards the left. White and black dots were painted on for visualization. Length scale on the right denotes 1 mm increments. As the shaker compresses the thorax, the wing joint and scutum separate.