

S2 Appendix. Tuning of Controller Procedure.

For every muscle experiment, all trials started with a twitch response followed by a series of step input responses. All controllers require tuning of parameters; therefore through the step input we were able to determine the tuning parameters. For instance, the PI controller requires tuning of two gains: k_P and k_I . A method similar to Ziegler-Nichols was implemented to identify these gains. S1 Fig. shows several trials for the step input to determine the appropriate tuning parameters to follow the desired trajectory, x_d . First, an arbitrary k_P gain was specified with zero k_I value. The k_P gain was increased until oscillations were observed from the muscle contractions. Next, k_P amount was lowered and k_I parameter was introduced. The process continues until the muscle contractions are able to follow x_d and tracking error is minimized. Nevertheless, tuning was performed several times for the same muscle due to the decay of muscle function throughout different trials. Similarly, tuning of parameter methodology was conducted of the nonlinear controllers, MRAC and ADP-PI.