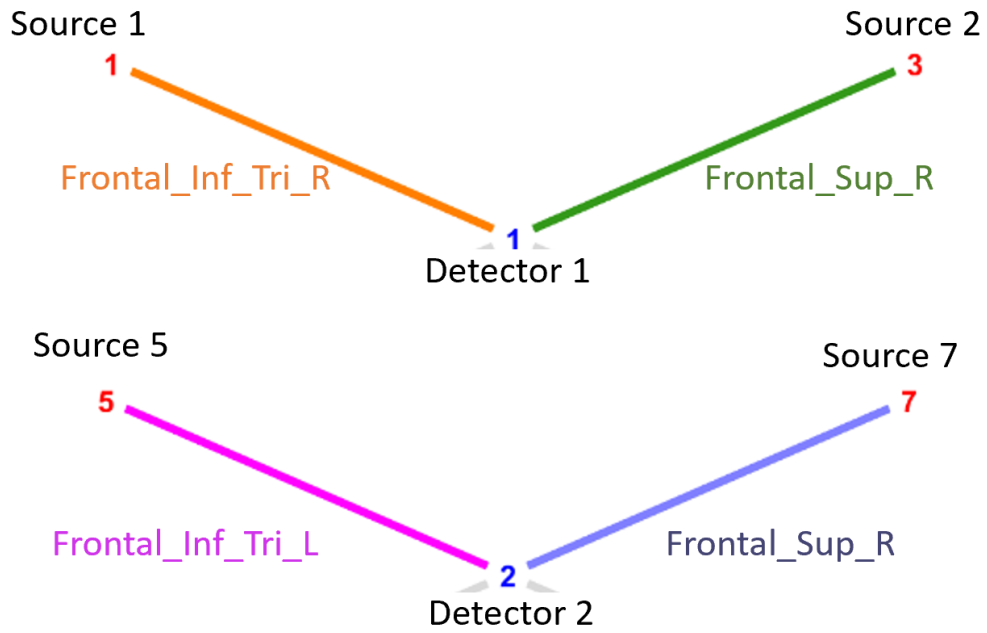
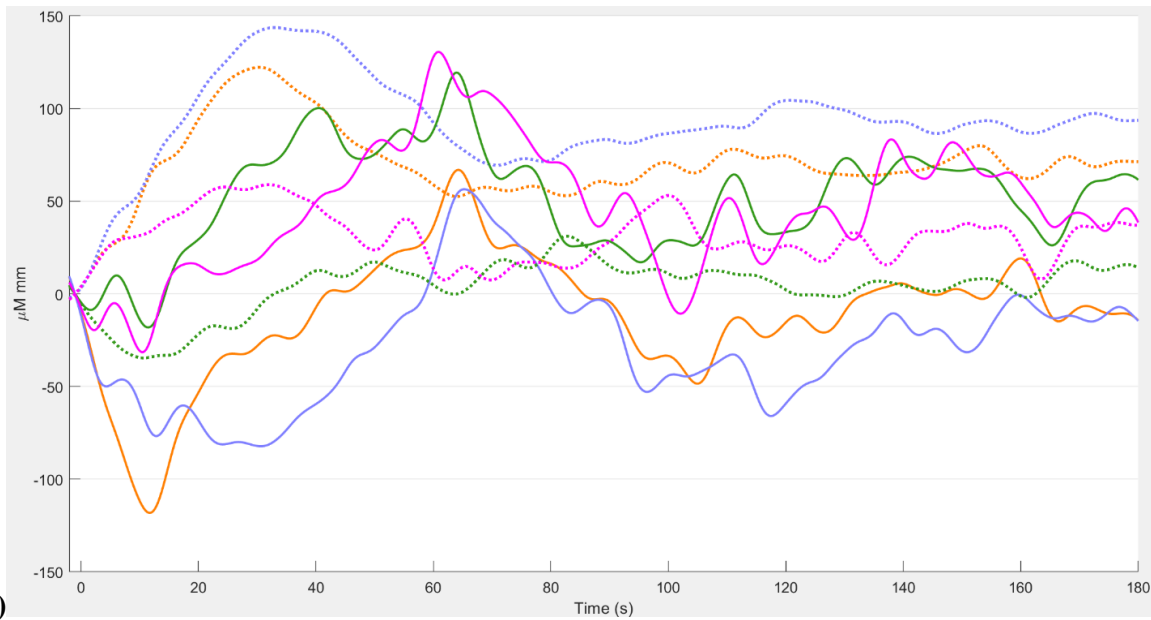


Supplementary Materials

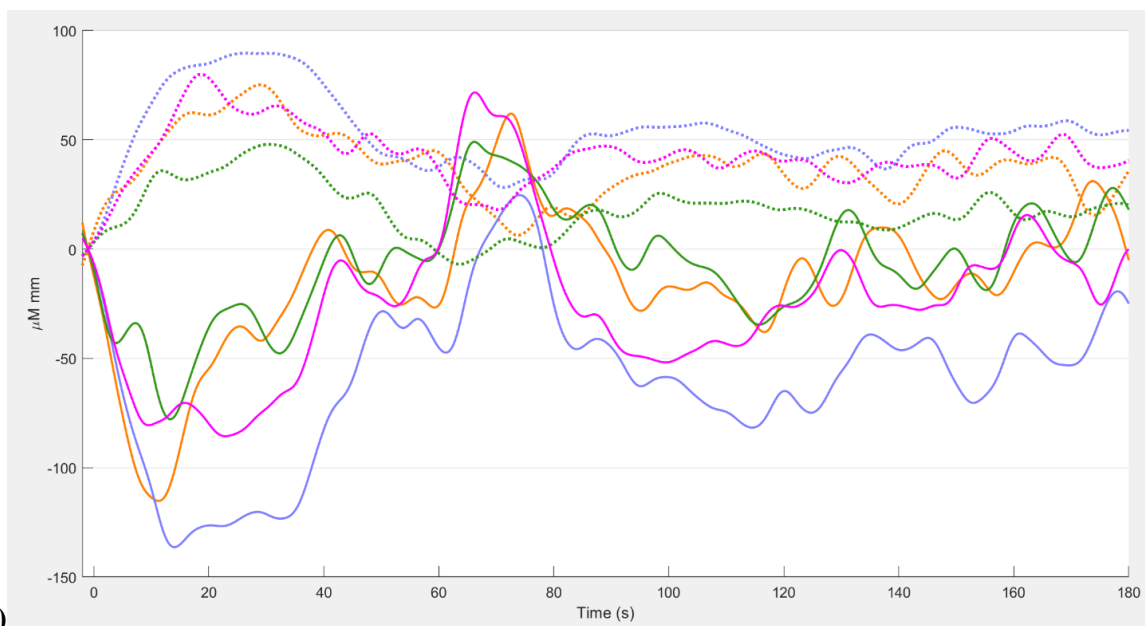


(A)

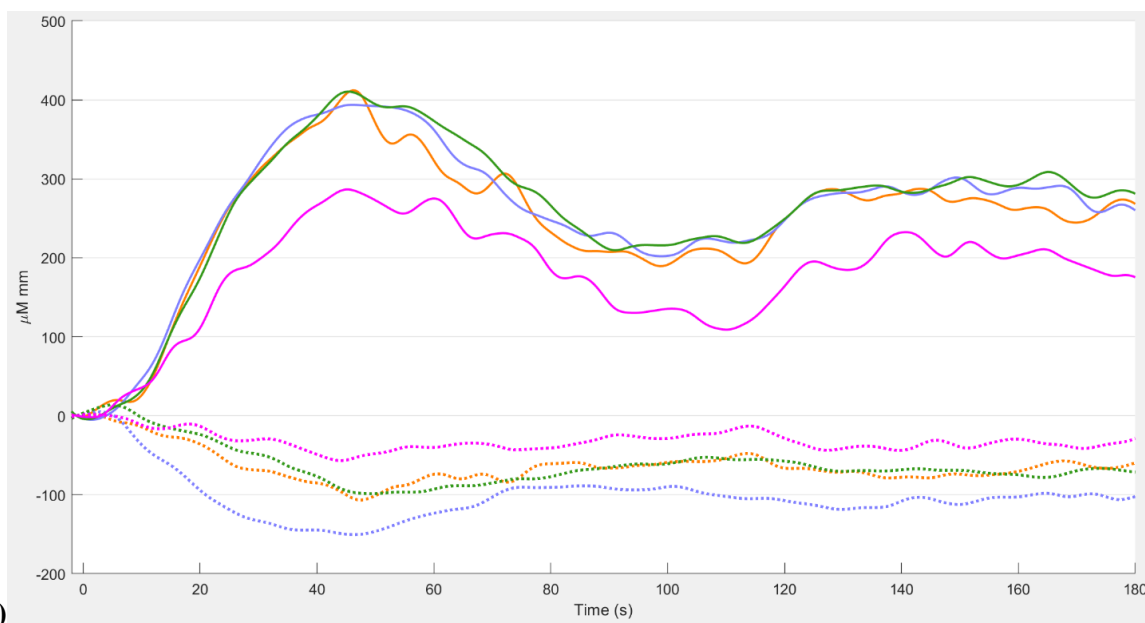


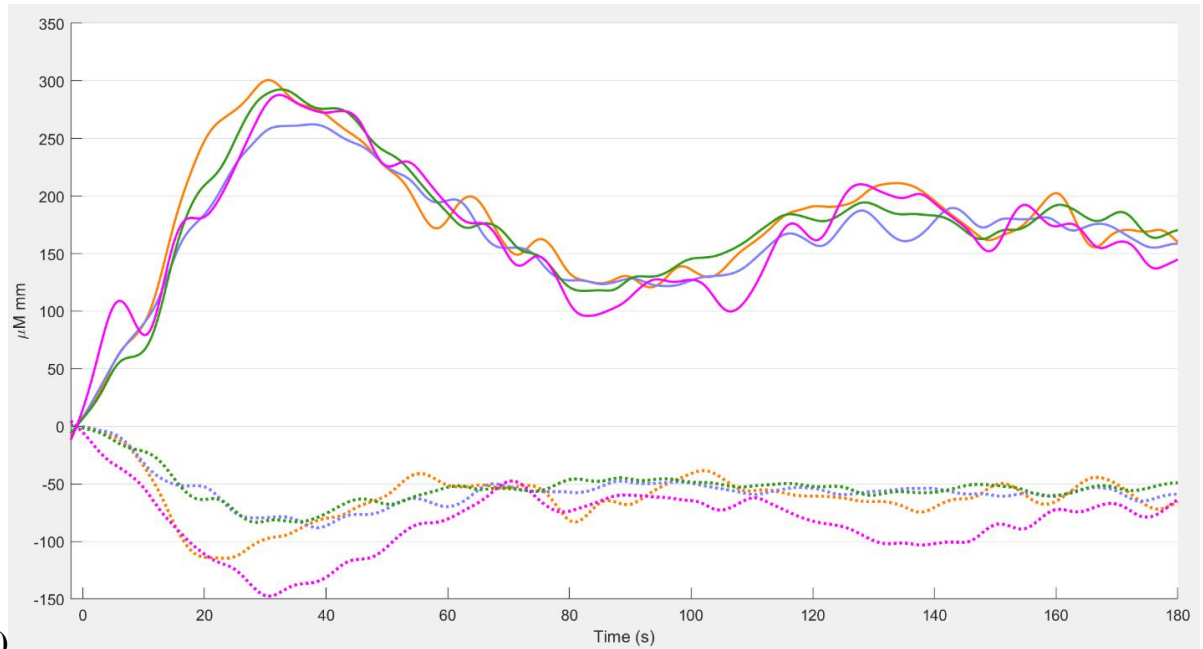
(B)

(C)

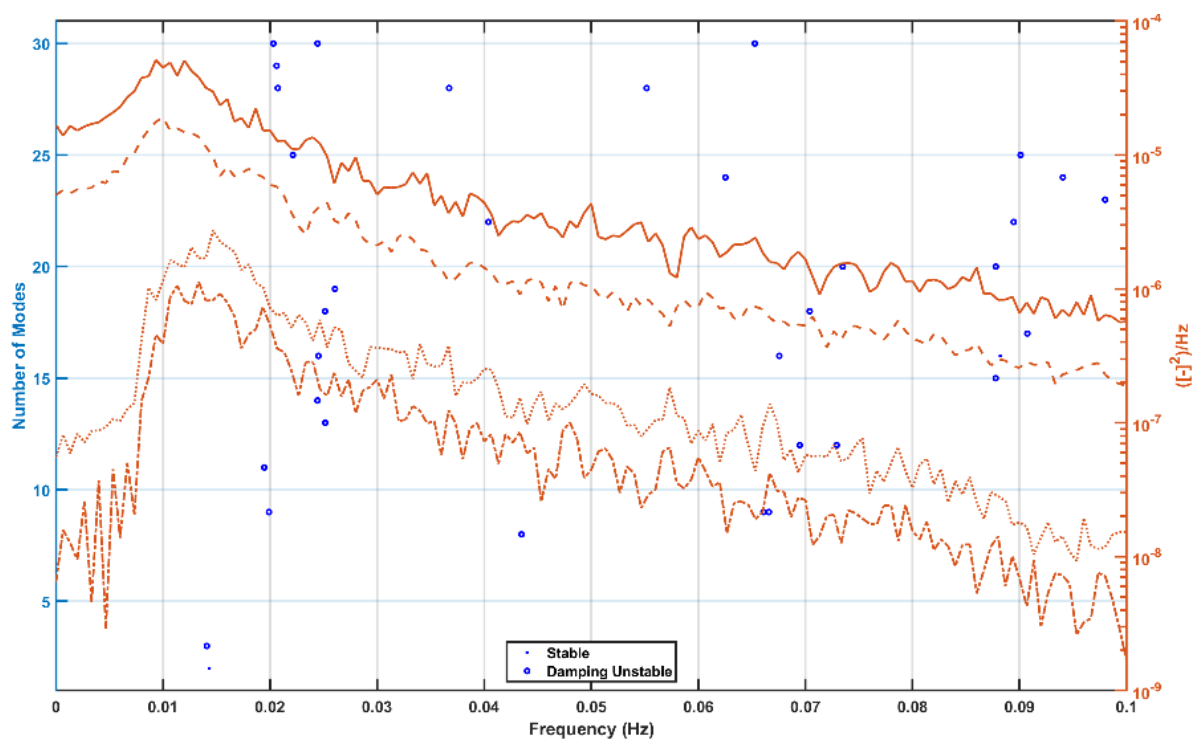


(D)

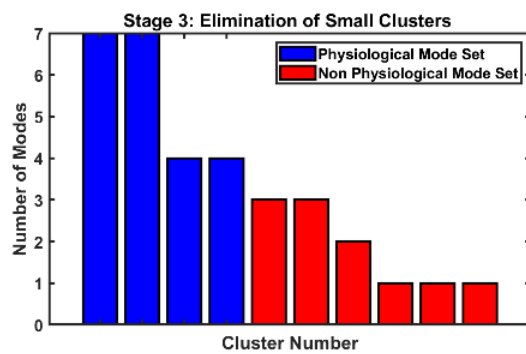
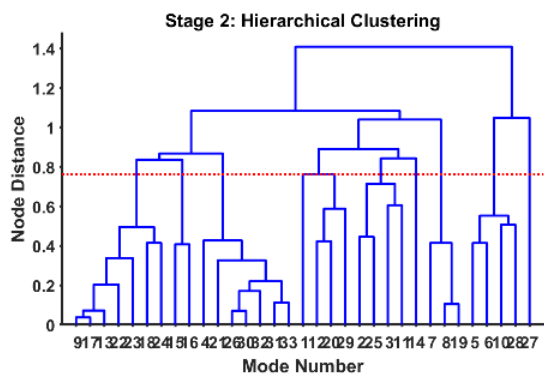
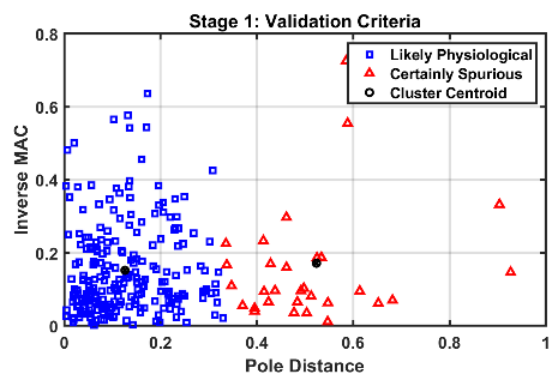
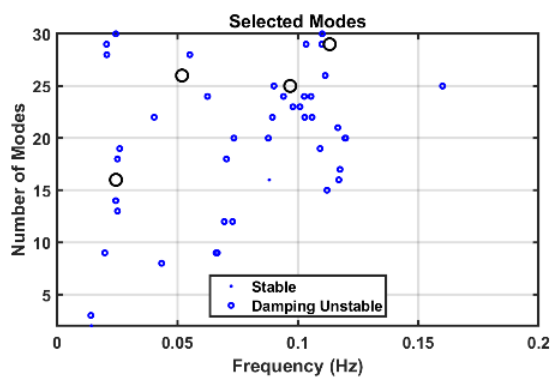




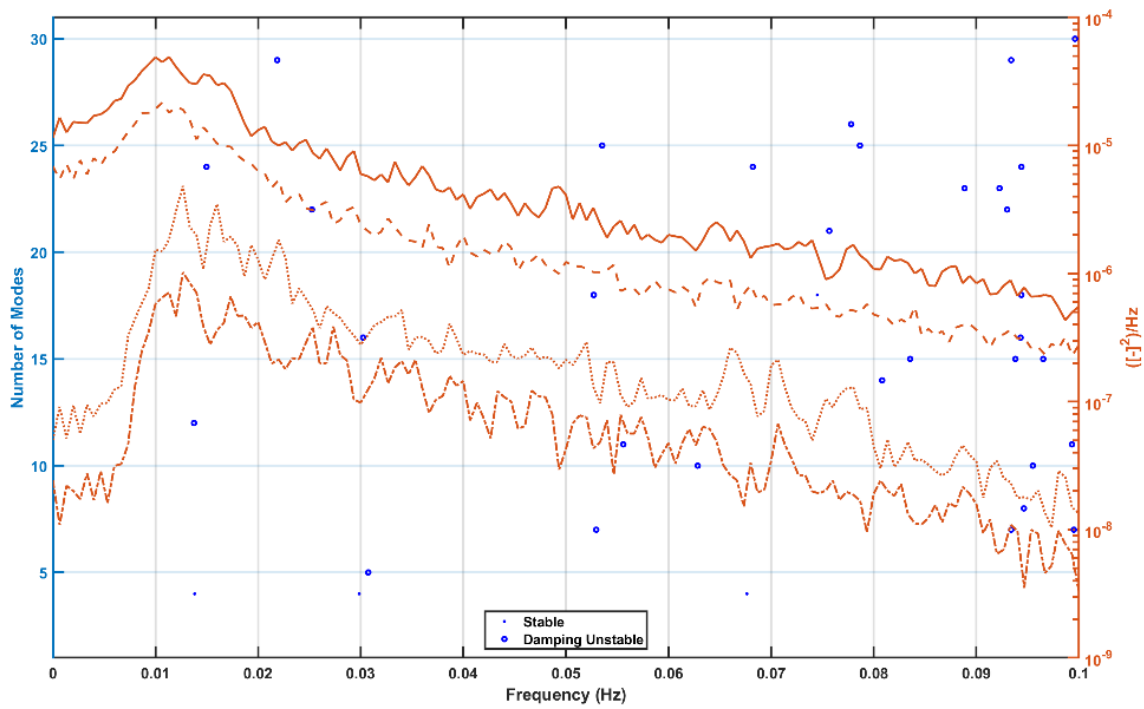
(E) Figure S1. Averaged hemodynamic response function (HRF) of the experimental groups with solid line showing oxyhemoglobin concentration changes and the dotted line showing the deoxyhemoglobin concentration changes. (A) Optode montage with colors denoting different prefrontal brain regions of interest. (B) Sedentary healthy control group HRFs. (C) Active healthy control group HRFs. (D) T2DM intervention group pre-intervention HRFs. (E) T2DM intervention group post-intervention HRFs.



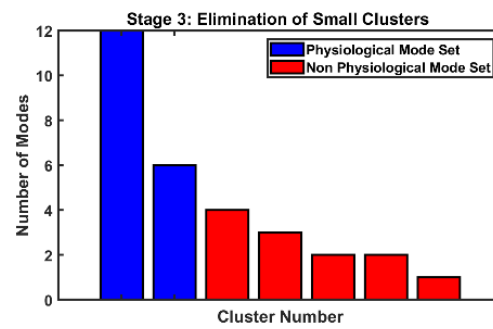
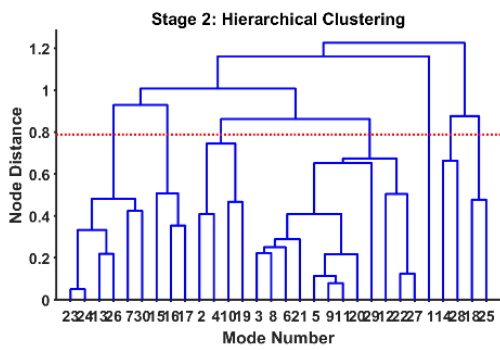
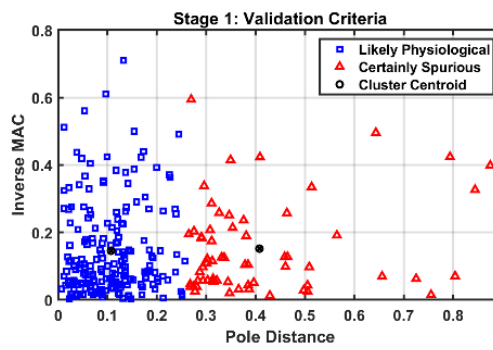
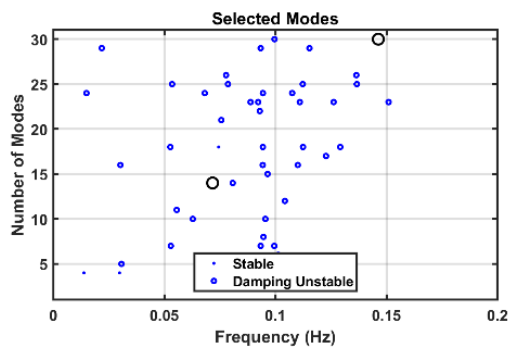
A1



B1

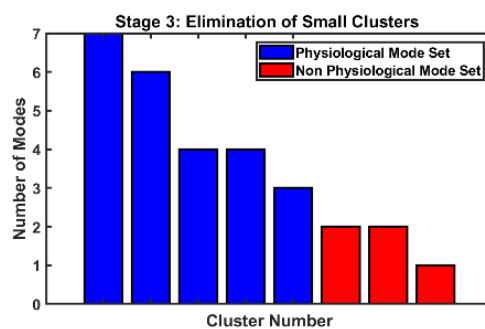
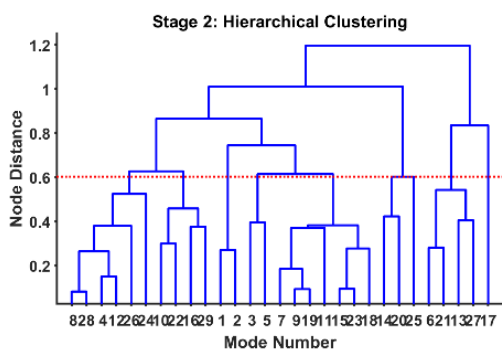
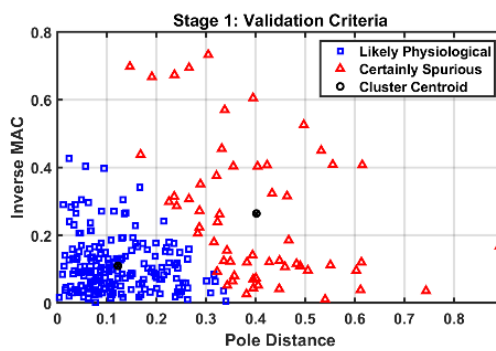
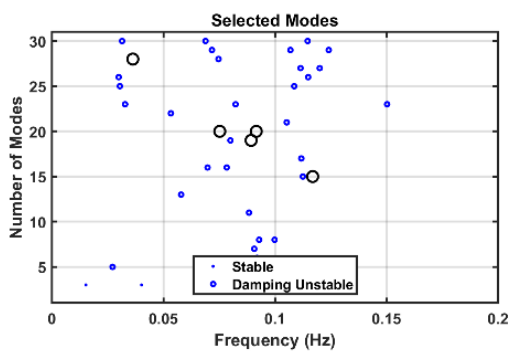
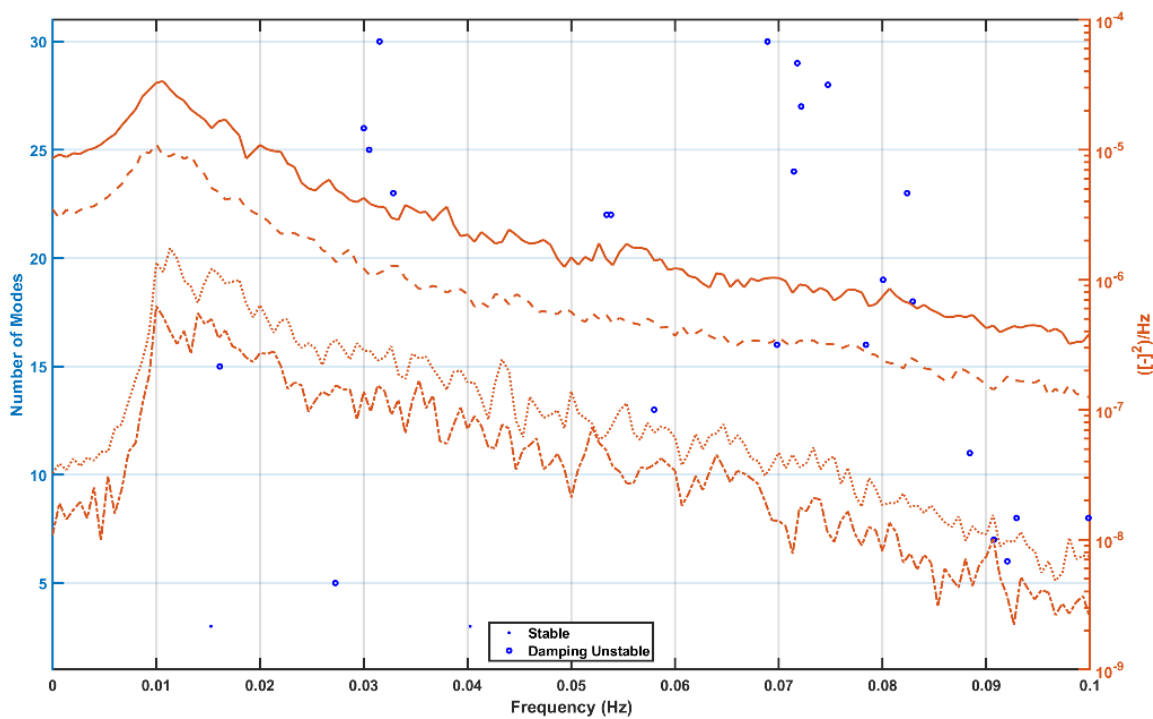


A2

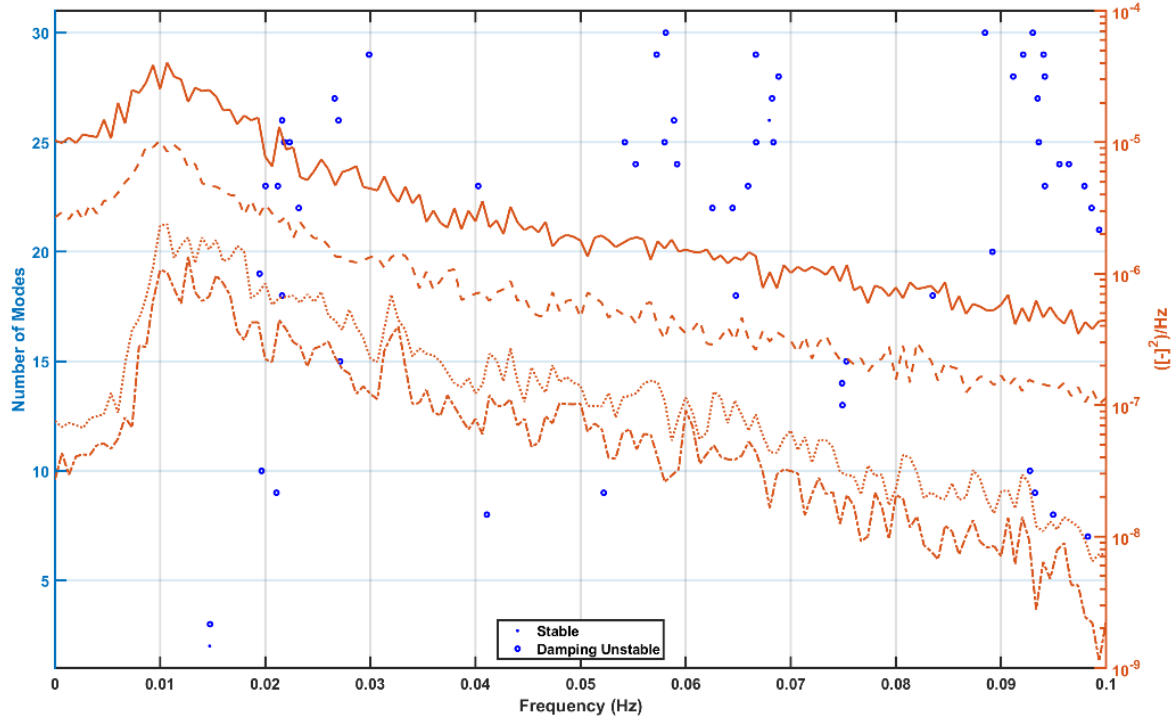


B2

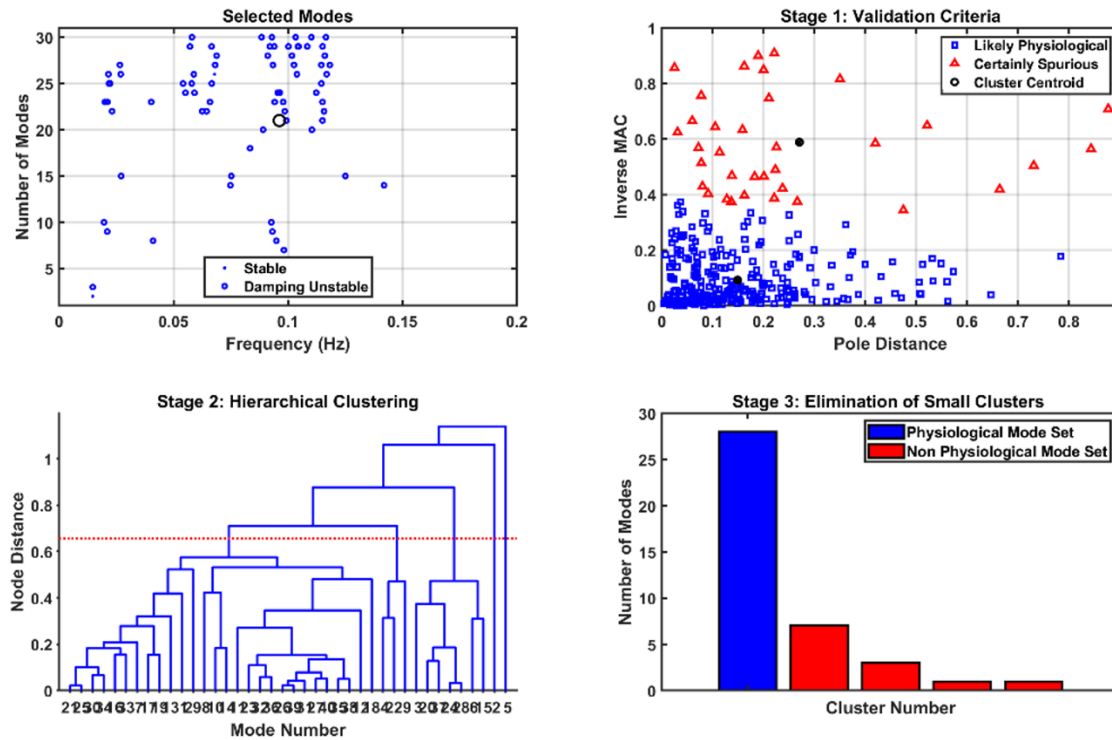
A3



B3



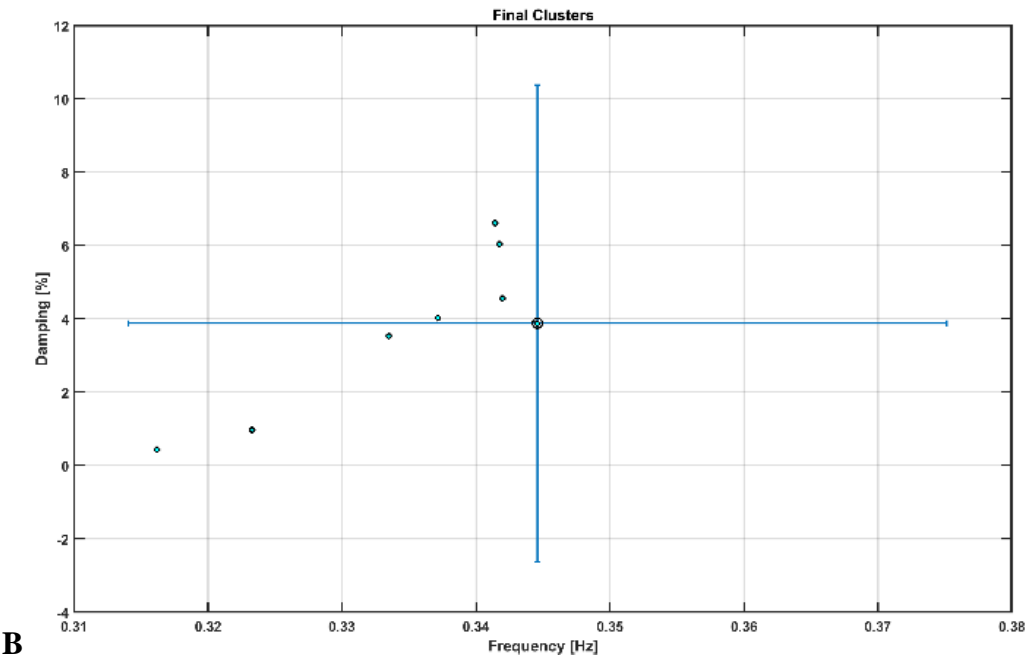
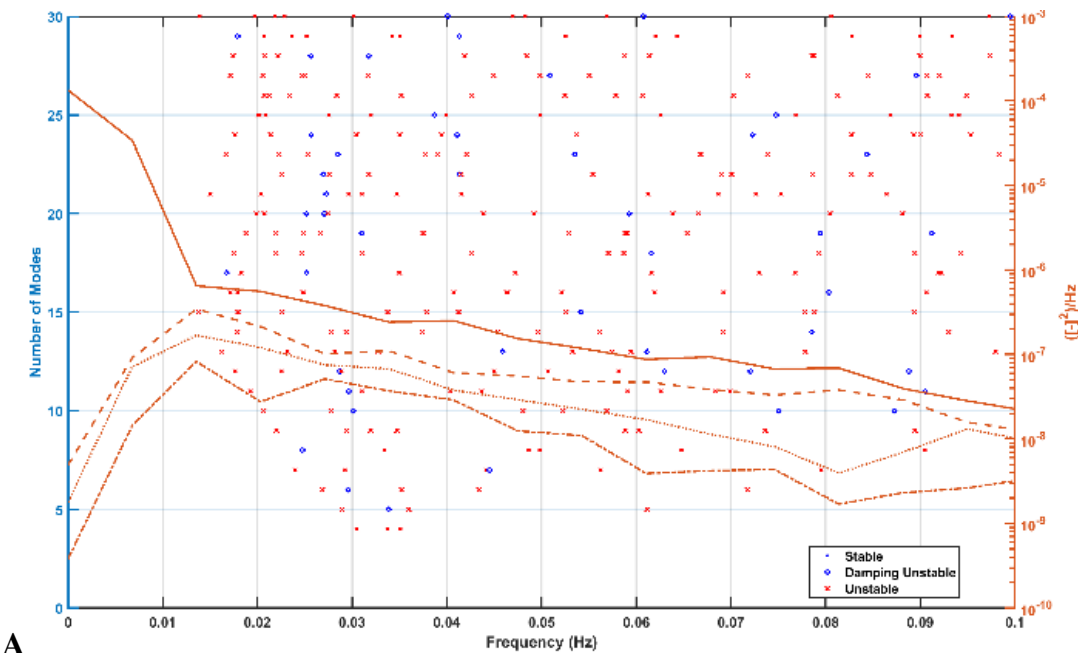
A4



B4

Figure S2. Operational modal analysis (OMA) of near-infrared spectroscopy effects with maximum 30 modes for the power spectrum $<0.1\text{Hz}$ in the stabilization diagram shown. Then, a multi-stage clustering for identifying physiological clusters using the Modal Toolkit (<https://code.vt.edu/vibes-lab/modal-analysis>). A1 and B1 are the stabilization diagram and the multi-stage clustering respectively for the Sedentary healthy control group. A2 and B2 are the stabilization diagram and the multi-stage clustering respectively for the Active

healthy control group. A3 and B3 are the stabilization diagram and the multi-stage clustering respectively for the T2DM intervention group pre-intervention. A4 and B4 are the stabilization diagram and the multi-stage clustering respectively for the T2DM intervention group post-intervention.



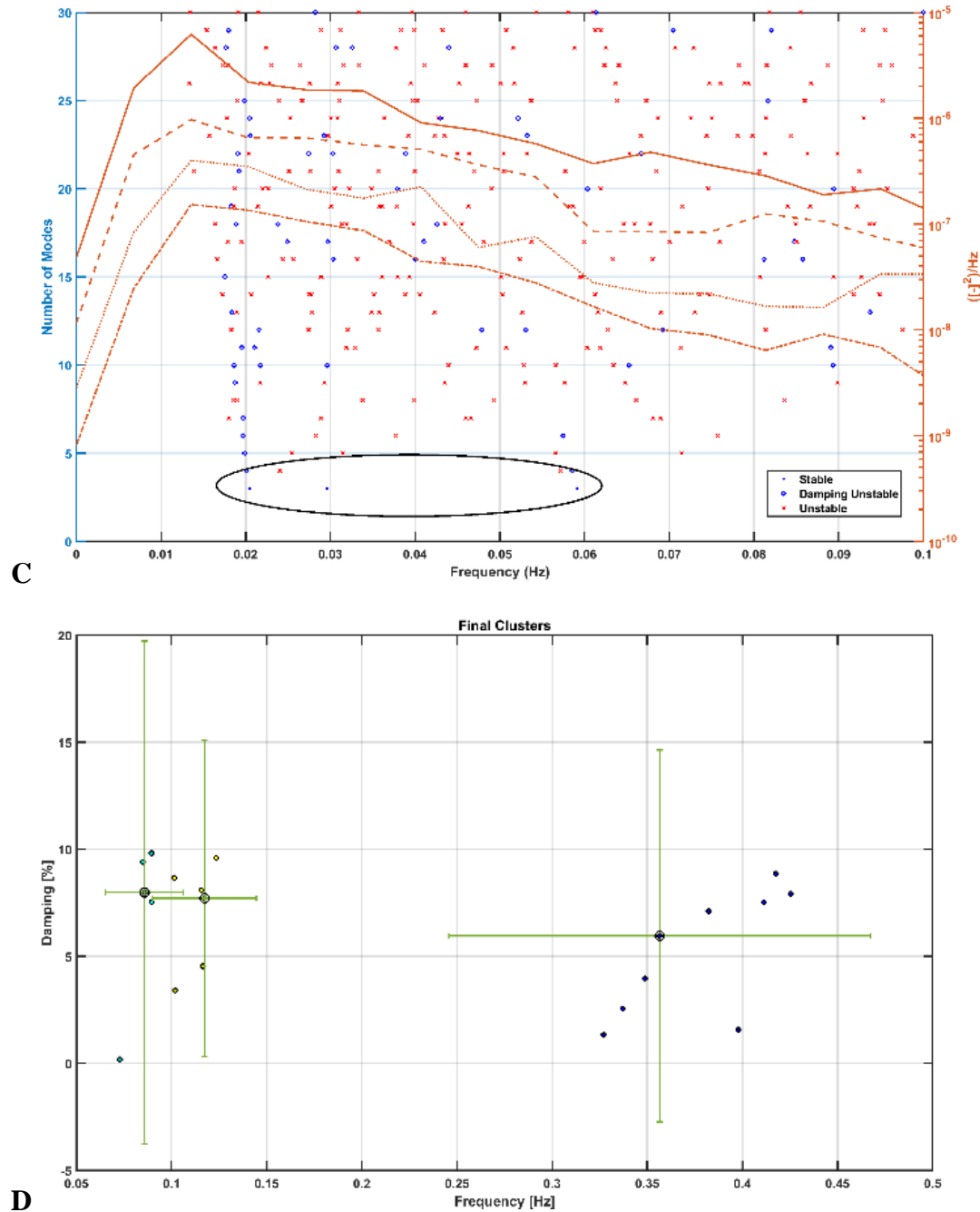


Figure S3. Operational modal analysis (OMA) of near-infrared spectroscopy signals from long-separation and short-separation channels with maximum 30 modes for the power spectrum $<0.1\text{Hz}$ in the stabilization diagram shown for health control subjects ($N=10$). Then, a multi-stage clustering for identifying physiological clusters using the Modal Toolkit (<https://code.vt.edu/vibes-lab/modal-analysis>). A. stabilization diagram for the short-separation near-infrared spectroscopy channels, B. multi-stage clustering for the short-separation near-infrared spectroscopy channels. C. stabilization diagram for the long-

separation near-infrared spectroscopy channels, D. multi-stage clustering for the long-separation near-infrared spectroscopy channels.

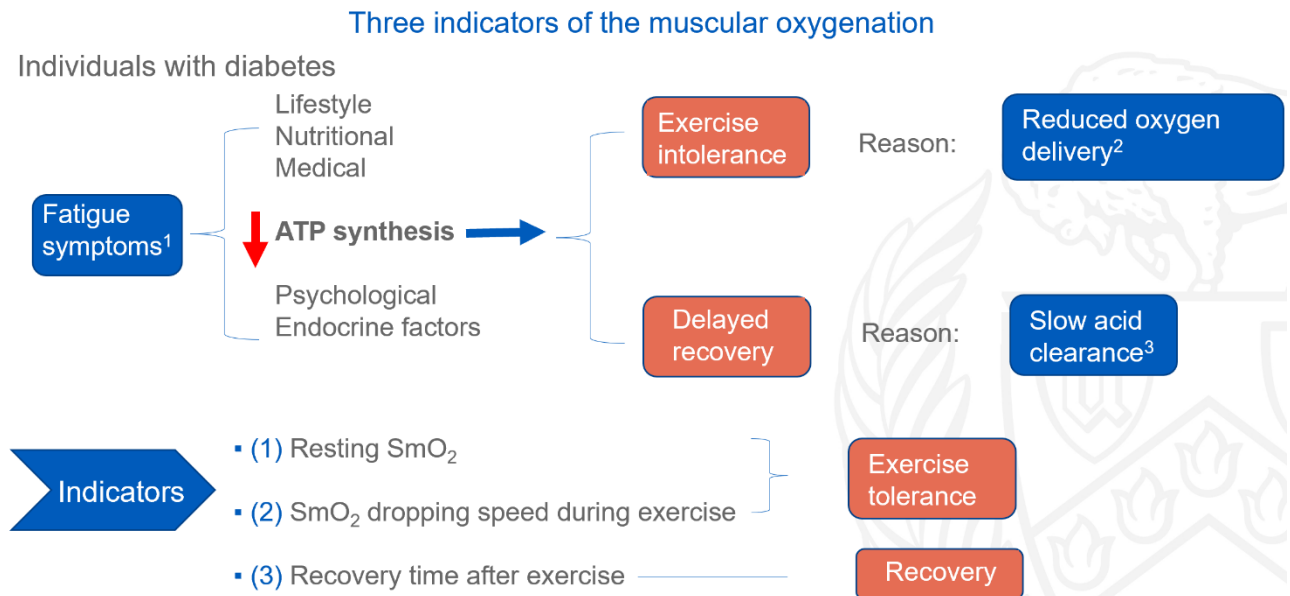


Figure S4. Postulated indicators of the muscle oxygenation response – resting SmO₂, SmO₂ drop during exercise, SmO₂ recovery after exercise.

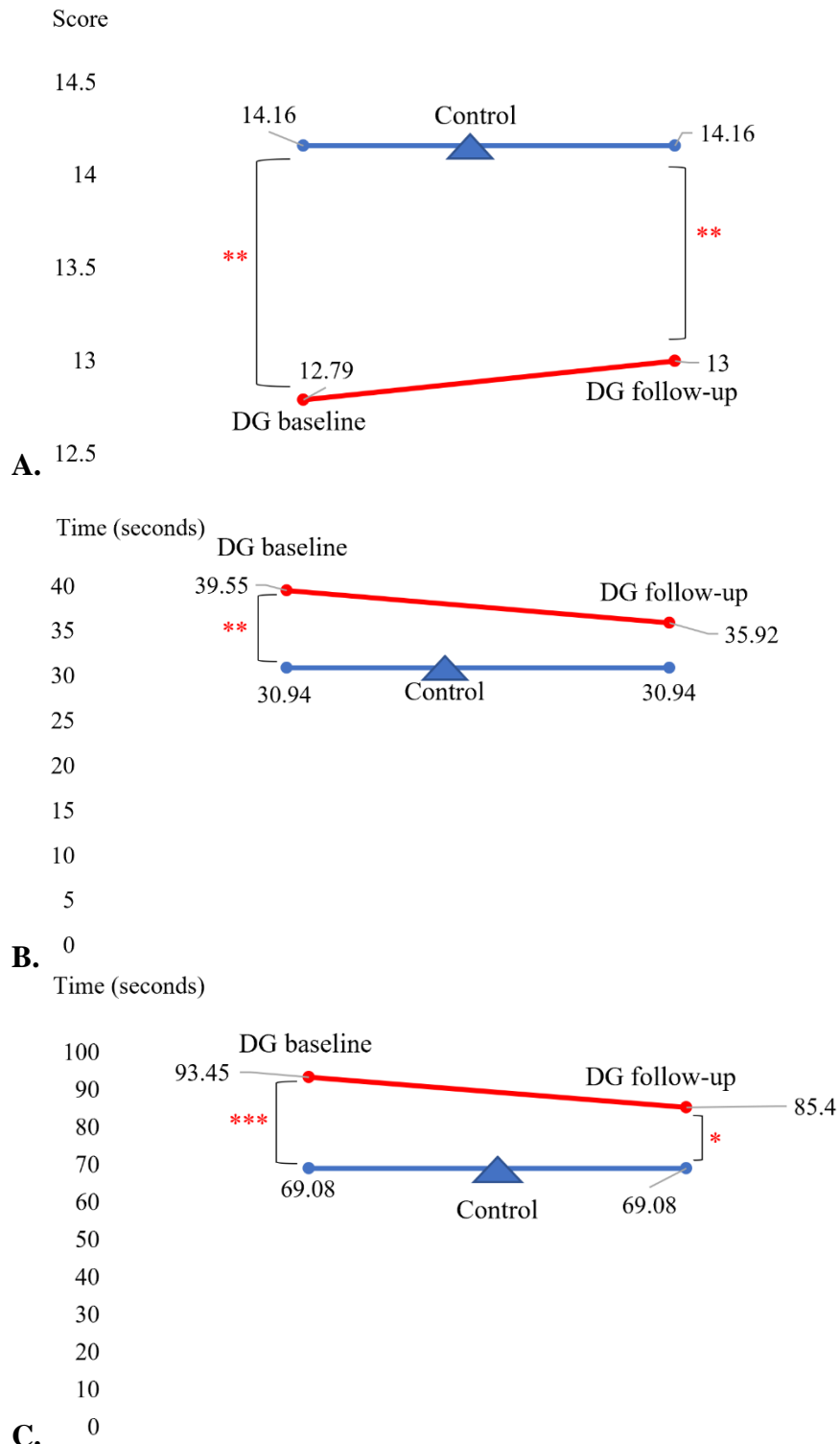


Figure S5. Cognitive test comparisons between pre-intervention baseline and post-intervention. A. Mini-Cog. B. Trail making test Part A. C. Trail making test Part B. “DG” is the T2DM Intervention group, The sedentary healthy Control group and the active healthy are combined in the Control group. * $p < 0.05$, ** $p < 0.01$, * $p < 0.001$.**