Project Posture

Santos, D. & Duarte, M. (2016). A public data set of human balance evaluations. *PeerJ*, *4*, e2648. doi: 10.7717/peerj.2648

Exploratory Purpose: To investigate for linear and/or non-linear relationships between various posturography (i.e., standing balance) and self-reported physical activity metrics.

Step 1: Discrete Variable Calculations

- For each trial calculate:
  - Multiple, Global Center of Pressure Variables (Duarte & Freitas, 2010)

Table 1. Variables for global analysis of center of pressure (CP) and codes to calculate these variables using the Matlab programming environment.

Variable	Description	Matlab Code
Total displacement of sway, DOT	'Size' or length of CP trajectory on the base of support	DOT=sum(sqrt(CPap.^2+CPml.^2));
Standard deviation	Dispersion of CP displacement from the mean position during a time interval	SDap=std(CPap); SDml=std(CPml);
RMS ('root mean square')	If the CP signal has zero mean, RMS and standard deviation provide the same result.	RMSap=sqrt(sum(CPap.^2)/length(CPap)); RMSml=sqrt(sum(CPml.^2)/length(CPml);
Amplitude of CP displacement	Distance between the maximum and minimum CP displacement for each direction	AdCPap=max(CPap) - min(CPap); AdCPml=max(CPml) - min(CPml);
Mean velocity (MV)	Determine how fast were the CP displacements	MVap=sum(abs(diff(CPap)))*freq/length(CPap) MVml=sum(abs(diff(CPml)))*freq/length(CPml)
Area	[vec,val]=eig(cov(CPap,CPml)); Area=pi*prod(2.4478*sqrt(svd(val)))	
Total mean velocity (TMV)	TMV=sum(sqrt(diff(CPap).^2+diff(CPml).^2))*freq/length(CPap)	

    - For more advanced example codes/visuals:
      - https://github.com/demotu/BMC
        - https://nbviewer.jupyter.org/github/BMClab/BMC/blob/master/notebooks/Stabilography.ipynb
        - https://nbviewer.jupyter.org/github/BMClab/datasets/blob/master/BDS/notebooks/BalanceDatasetAnalysis.ipynb
        - https://nbviewer.jupyter.org/github/BMClab/datasets/blob/master/BDS/notebooks/BalanceDatasetSelection.ipynb
  - Ellipse area (Duarte, 2015)
    - For more advanced example codes/visuals:
      - https://nbviewer.jupyter.org/github/BMClab/BMC/blob/master/notebooks/PredictionEllipseEllipsoid.ipynb

Step 2: Exploratory Analysis/Machine Learning

- Investigate for linear and/or non-linear associations between various posturography and self-reported physical activity metrics using data analytics, machine learning, and/or related techniques/processes.

Note: Significantly contributing to this project (both in terms of data analysis and writing) will qualify you for authorship (subject to the approval of Drs. Pennell and Scalzo) if a publication(s) stems from these efforts. If interested in being an author, be sure to regularly communicate such intentions with Drs. Pennell and Scalzo so that adequate contracts/expectations can de delineated.