

# Associations of Static Posture with Rosenberg Self-Esteem and Global Health

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# Background

- Among clinically depressed patients, the recall of negative words was more common in slumped positions whereas patients in an upright position recalled an even number of positive and negative words [1].
  - Power Posing [2]
  - Psychological effect
- Slouched posture is linked with increase fatigue. [3]
  - Poor blood circulation
  - Increase tension of muscles
- Feelings of confidence and satisfaction lead to a more upright posture than depressive feelings, that lead to a more slouched posture. [4]
  - Looking better = Feeling better
- It is unknown if the Rosenberg and SF-36 questionnaires are indicative of objective postural measurements.

# Purpose

- The purpose of this study was to assess the association between a person's usual posture, their self-esteem and health by correlating the Rosenberg and SF-36 questionnaires to various postures.
  - Standing Posture
  - Sitting Posture
  - Functional Posture

# Participants

- This was a cohort study on static posture and its correspondence with self-esteem and global health ratings.
- 63 total subjects were recruited between the ages of 20 and 31 with an average age of  $22.02 \pm 2.04$  (19.04% Male & 80.95% Female)
- They were recruited within the following programs:
  - The University of Tennessee at Chattanooga Doctor of Physical Therapy Program (50%)
  - The University of Tennessee at Chattanooga Doctor of Occupational Therapy Program (50%)
- This study was approved by the University of Tennessee at Chattanooga Institutional Review Board (IRB #20-001)



# Marker Placement

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- C2
- C7
- T7
- Acromion Process
- ASIS
- PSIS
- Lateral Femoral Epicondyle
- Lateral Malleolus

# Posture Assessment

- Standing Posture:
  - Participant was asked to stand on a X marked spot facing the wall so their dominant side (based on the hand they write with) is facing the camera. Participants were instructed to march in place for 10 seconds and then relax into a comfortable position. A full body picture was taken after about 30 seconds.
- Sitting Posture:
  - Participant was asked to sit on a stool placed over an X marked spot facing the wall so their dominant side is facing the camera. They were instructed to simply sit in a way that is most comfortable for a minute. Between the 30-second and 1-minute mark, a full body picture was taken.
- Functional Posture:
  - Participant was asked to stand on a X marked spot facing the wall so their dominant side is facing the camera. They were asked to relax and scroll through their phone, checking social media or emails. Between the 30-second and 1-minute mark, a full body picture was taken.



# Acute Angle Measurements

## Forward Head

- Vertical → C7 → C2

## Rounded Shoulder

- Acromion Process → T7 → Vertical

## Kyphosis

- C7 → T7 → Vertical

## Pelvic Tilt (posterior = negative angle)

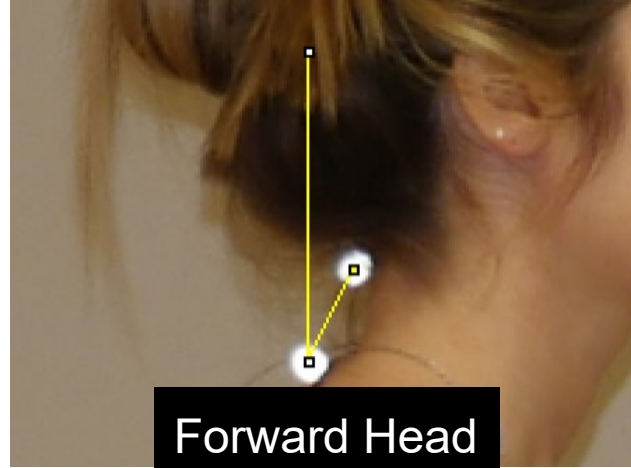
- Horizontal → anterior superior iliac spine → posterior superior iliac spine

## Recurvatum (hyperextension = negative angle)

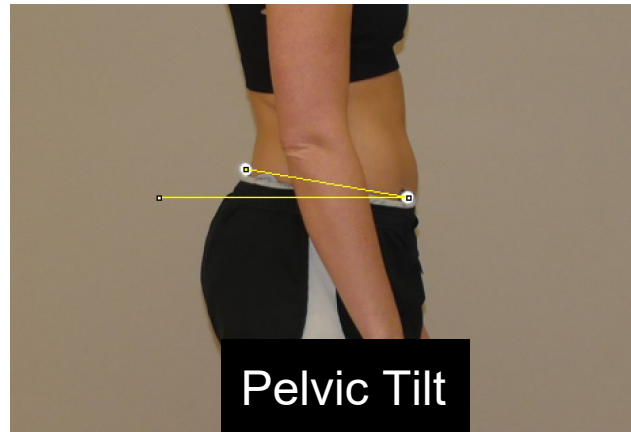
- Anterior Superior Iliac Spine → Lateral Epicondyle → Lateral Malleolus



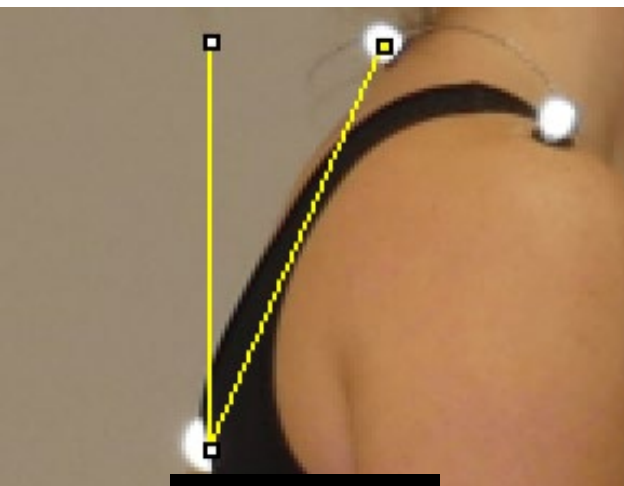
Recurvatum



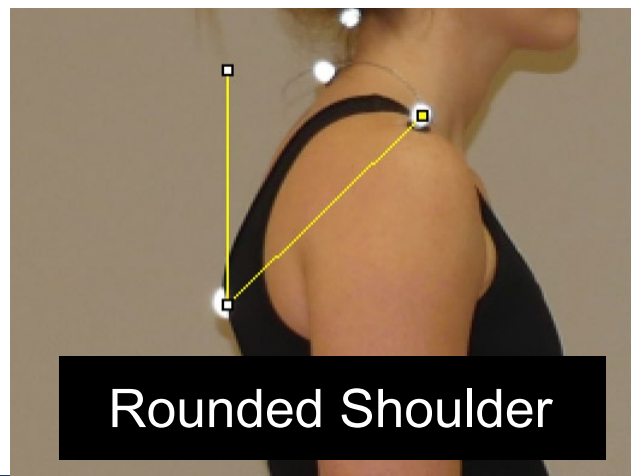
Forward Head



Pelvic Tilt



Kyphosis



Rounded Shoulder

# Data Acquisition

- All measurements were captured with a Panasonic Lumix GH4 camera
- Inter-rater reliability was established by using the Intra-class Correlations of five testers prior to analysis
  - 9 angles from 10 random subjects were used
  - Lowest inter-rater reliability was 0.70 (ICC): Sitting Forward Head (SEM: 3.97°)
    - Moderate inter-rater reliability
  - Highest inter-rater reliability was 0.96 (ICC): Sitting Rounded Shoulder (SEM: 0.54°)
    - Excellent inter-rater reliability
- Angles for each participant's measurements were calculated using ImageJ software[6]



# Surveys

- Short Form- 36 Health Survey
  - A 36-question health survey that quantifies perception of health
    - Broken into 8 categories: physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions.
- Rosenberg Self-Esteem Scale
  - A 10-question scale that quantifies perception of self-esteem

# Analysis

- Clusters were determined based off our 9 postural measurements
  - Sitting Forward Head, Standing Forward Head, Sitting Rounded Shoulder, Standing Rounded Shoulder, Sitting Kyphosis, Standing Kyphosis, Sitting Pelvic Tilt, Standing Pelvic Tilt, and Standing Recurvatum
- Participants with maligned slouched posture were assigned to Cluster 1 while those with upright posture were assigned to Cluster 2
  - 6 subjects were removed from clusters due to incomplete surveys
- We used a Backward Stepwise Logistic Regression ( $p_{out} = 0.10$ ) to determine which Patient Reported Outcome components were more predictive of slouched posture.

# Creating Clusters

Posture	Angle Measurements (Degrees)	Cluster 1: Slouched Posture (Mean $\pm$ SD)	Cluster 2: Upright Posture (Mean $\pm$ SD)
Stand	Recurvatum	3.43 $\pm$ 4.54	2.23 $\pm$ 4.66
	Pelvic Tilt	13.58 $\pm$ 5.16	11.64 $\pm$ 6.89
	Rounded Shoulder	48.64 $\pm$ 5.59	39.58 $\pm$ 6.39
	Forward Head	30.49 $\pm$ 7.20	19.87 $\pm$ 5.78
	Kyphosis	20.03 $\pm$ 4.83	16.88 $\pm$ 3.82
Sit	Pelvic Tilt	-0.43 $\pm$ 9.14	-6.06 $\pm$ 10.02
	Rounded Shoulder	57.53 $\pm$ 5.39	45.88 $\pm$ 7.39
	Forward Head	34.05 $\pm$ 9.12	23.65 $\pm$ 5.37
	Kyphosis	24.27 $\pm$ 5.76	19.48 $\pm$ 4.55
Functional	Recurvatum	4.61 $\pm$ 6.11	1.78 $\pm$ 6.51
	Pelvic Tilt	10.35 $\pm$ 5.54	7.2 $\pm$ 6.82
	Rounded Shoulder	47.03 $\pm$ 6.00	35.66 $\pm$ 6.05
	Forward Head	38.81 $\pm$ 9.38	29.47 $\pm$ 7.55
	Kyphosis	22.39 $\pm$ 4.56	16.45 $\pm$ 4.39

# Logistic Regression Analysis

## Univariate Analysis

Variables	B (unstandardized)	Exp(B)	Total Accuracy
Role Limitations Due to Physical Health	-0.473	0.623	0.002
Energy/Fatigue	0.08	0.923	0.028
Emotional Well-Being	0.68	1.071	0.079
Social Functioning	-0.112	0.894	0.004
Rosenberg	0.194	1.214	0.013

## Multivariate Analysis

	Upright	Slouched
<b>Positive</b>	<b>13</b>	<b>8</b>
<b>Negative</b>	<b>5</b>	<b>31</b>

- Sn: 0.722
- Sp: 0.795
- Multivariate Odds Ratio: 10.075 ( $p < 0.001$ )
- Nagelkerke R Squared: 0.467

# Conclusion/Future Directions

- Components of the SF-36 and the Rosenberg surveys were able to explain 46.7% of the variance in cluster membership with an accuracy of 77.2%. Within the SF-36, scoring worse on the following subscales were more predictive of slouched posture:
  - Role Limitations due to Physical Health, Energy/Fatigue, Emotional Well-being, and Social Function
- Research is needed to determine associations between slouched posture and objective physical impairments and how slouched posture decreases global well-being and quality of life.
- COVID 19 modifications

# Clinical Significance

- How is upright posture related to you?
  - May enhance self-esteem & global health
  - Positive narrative for outside perceivers
- Clinically, we as healthcare professionals should be mindful of our patients' posture and treat patients more holistically
  - There may be other factors that need to be addressed biopsychosocially



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