

Measuring Posture objectively using a low cost mobile 2D App

(still in development)

Dr Josette Bettany-Saltikov

Mrs Jane Johnson

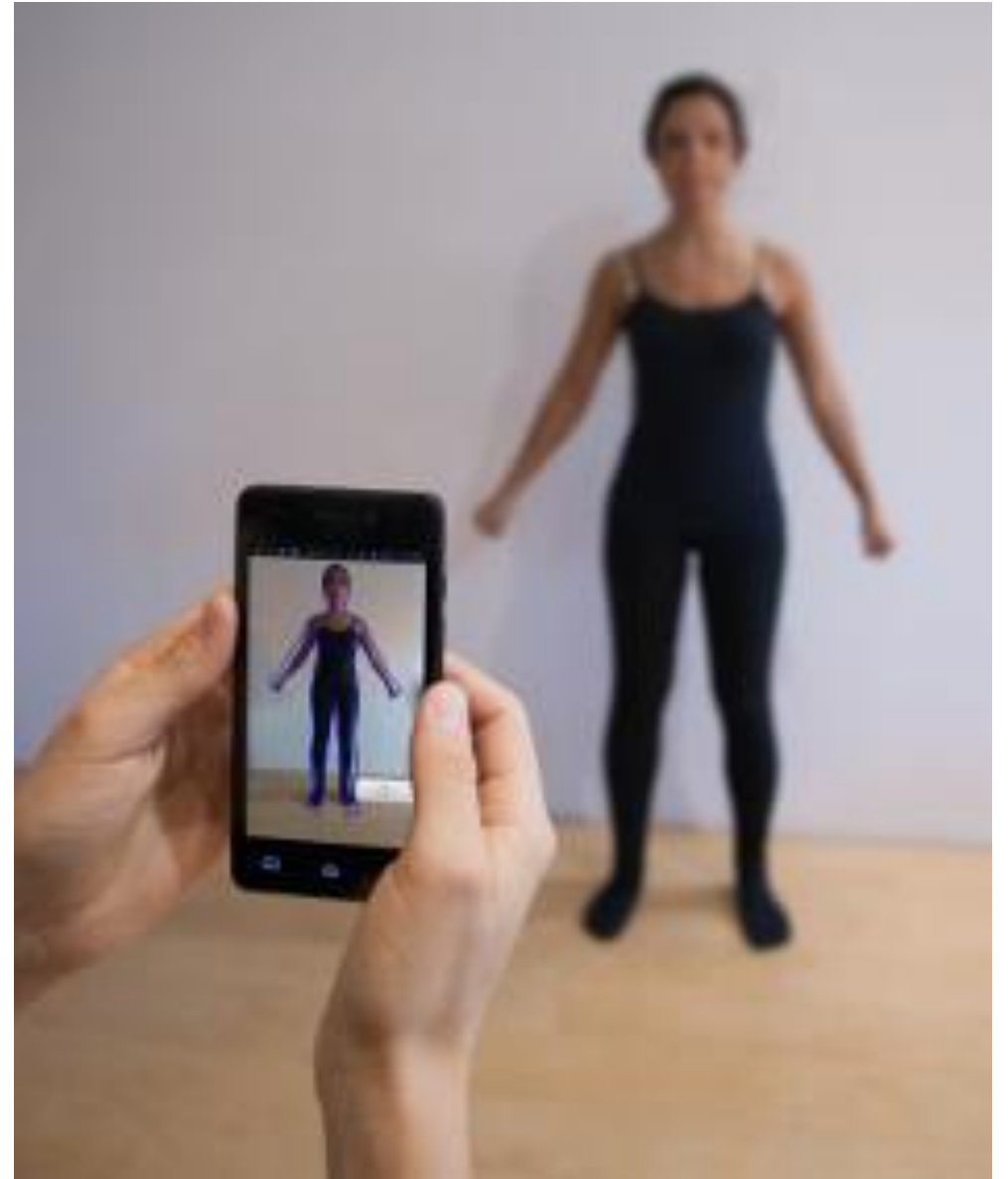
Dr Paul Van Schaik

Dr Julien Cordry

Dr David Newell



Development of a low cost, portable, valid and reliable postural assessment app for use by chiropractors (or any other manual therapist) treating patients with back or neck pain in the clinic.





Jane Johnson (1)

Dr Josette Bettany-Saltikov (1)

Dr David Newell (2)

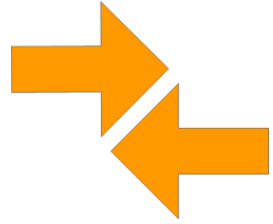
Professor Paul van Schaik (1)

Dr Julien Cordry (1)



(1) Teesside University, UK.
(2) The Anglo European
College of Chiropractic
representing the Royal College
of Chiropractors, UK.

Why? Objective evidence based measures of posture are needed



Is there a relationship between posture and pain?

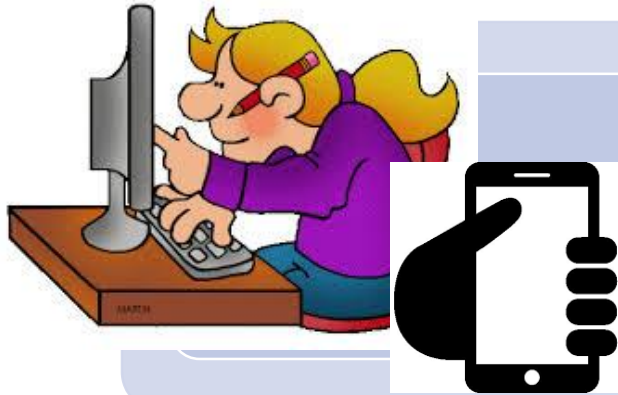


Does intervention by a chiropractor/PT/orthotist change posture?



Does postural change correspond to symptom change?

3 stages to the project



Background
research +
development
of app
prototype



App testing,
de-bugging
and trialing



Data
collection,
analysis and
reporting

Scoping review

The screenshot shows a web browser window displaying the Google Play Store search results for the keyword "posture". The browser's address bar shows the URL <https://play.google.com/store/search?q=posture&rc=apps>. The Google Play Store interface includes a search bar with "posture" entered, a navigation menu on the left with options like "My apps", "Shop", "Games", "Family", and "Editors' Choice", and a main content area displaying a grid of 24 app cards. Each card features an app icon, title, developer name, and user ratings. The Windows taskbar at the bottom shows the system tray with the time 13:46 and date 25/04/2016.

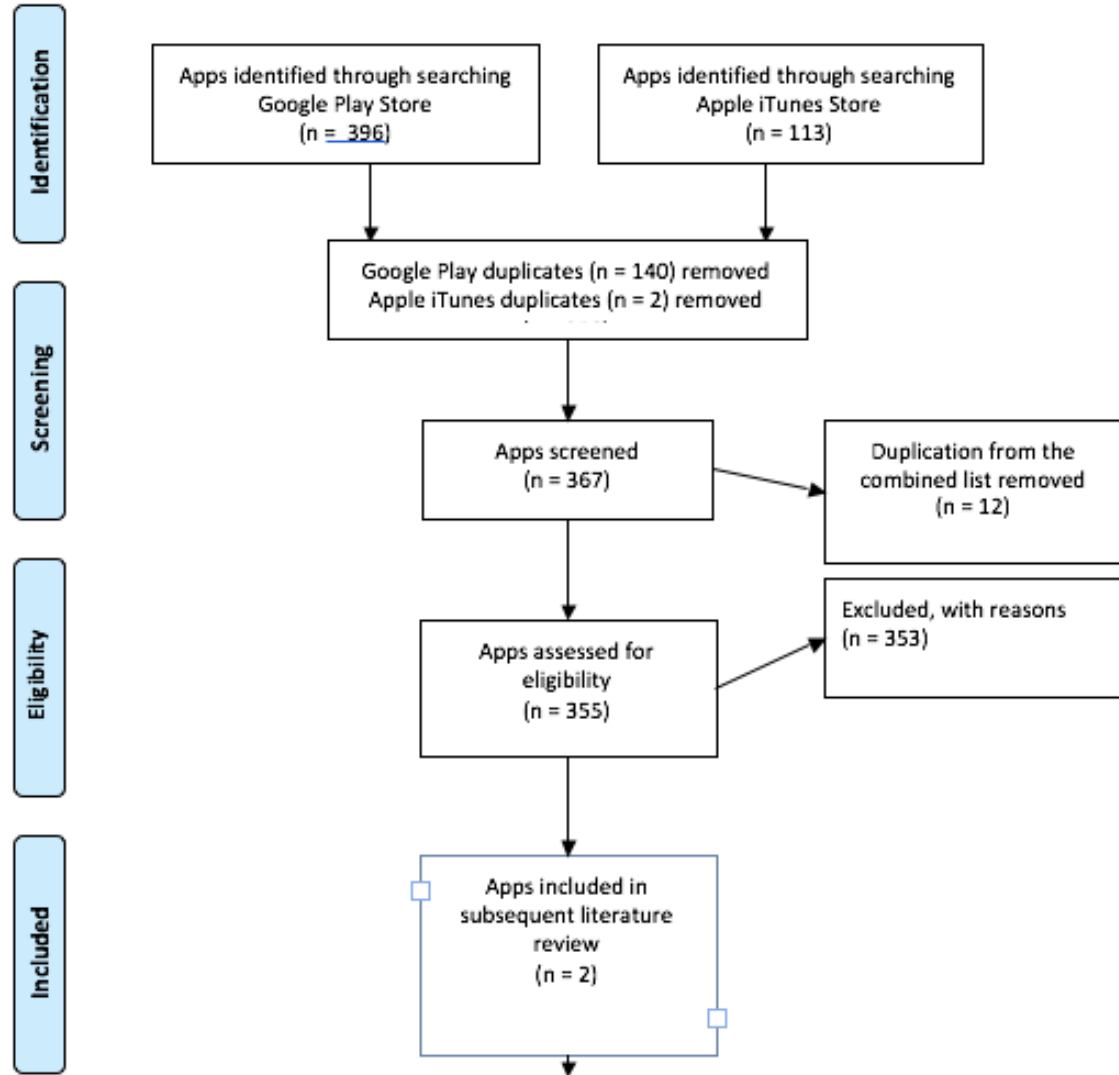
App Name	Developer	Price	Rating
PostureScreen Mob	PostureCo, Inc.	£12.70	★★★★☆
Forward Head Post	SD Net	★★★★☆	★★★★☆
Posture Reminder	Or Oz	★★★★☆	★★★★☆
Good Posture	Boyer Pierre-louis	★★★★☆	★★★★☆
IMPROVE YOUR POSTURE	Daily Back Exercise Body Program	★★★★☆	★★★★☆
HOW TO GET THE PERFECT POSTURE	How to Get the Perf Fitness Tips	★★★★☆	★★★★☆
PostureCorrection	3D Incorporated	★★★★☆	★★★★☆
My Neck	Secnd Step	★★★★☆	★★★★☆
Neck Workout Exer	Rhyslong	FREE	★★★★☆
Scoliosis App	ShoutEm, Inc.	★★★★☆	★★★★☆
Relieve Neck Pain	CLOUDSPIRIT LTD	★★★★☆	★★★★☆
Posture Corrector	Sudhansu Sekhar Sams	★★★★☆	★★★★☆
Scoliometer	uFizjo.pl - sklep fizjoter	★★★★☆	★★★★☆
Right Neck Browser	13month	FREE	★★★★☆
Straighten your bac	CatWay	★★★★☆	★★★★☆
Pocket Yoga	Rainfrog, LLC	★★★★☆	★★★★☆
Posture Mama	Independent Apps LLC	★★★★☆	★★★★☆
30 Day Back Challer	Teer Studios	FREE	★★★★☆
FitStadium Person	FitStadium	★★★★☆	★★★★☆
Freeletics Bodyweig	Freeletics	★★★★☆	★★★★☆
HSE.Ergo.OWAS	RNI Group	★★★★☆	★★★★☆
Shaolin Kung Fu LIT	YMAA	★★★★☆	★★★★☆
Om Dhyan	Anomsoft Solutions Pvt	★★★★☆	★★★★☆
Karateka Classic	DotEmu	★★★★☆	★★★★☆

Scoping review

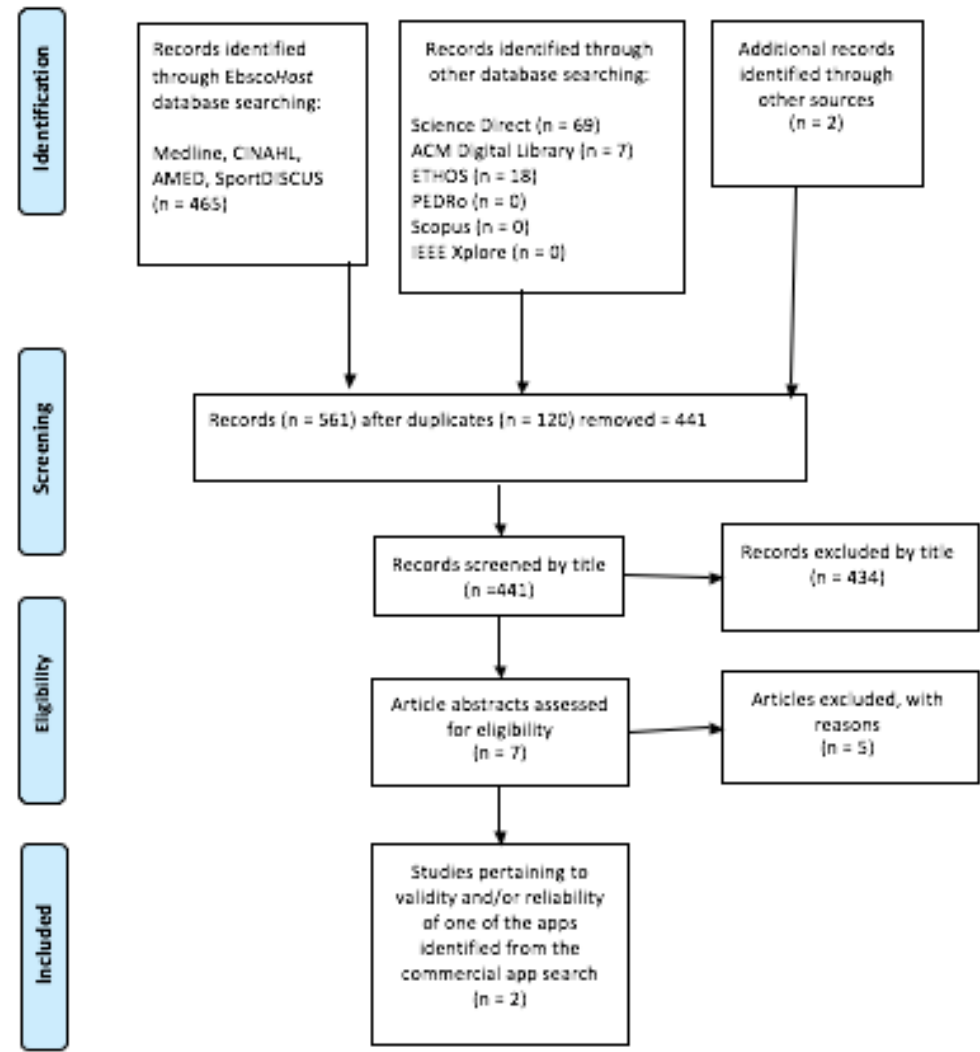
n = 2 met search criteria

+ 2 tablet based

+ 1 elsewhere



Traditional literature search for articles relating to validity and/or reliability of one the 5 apps n = 2

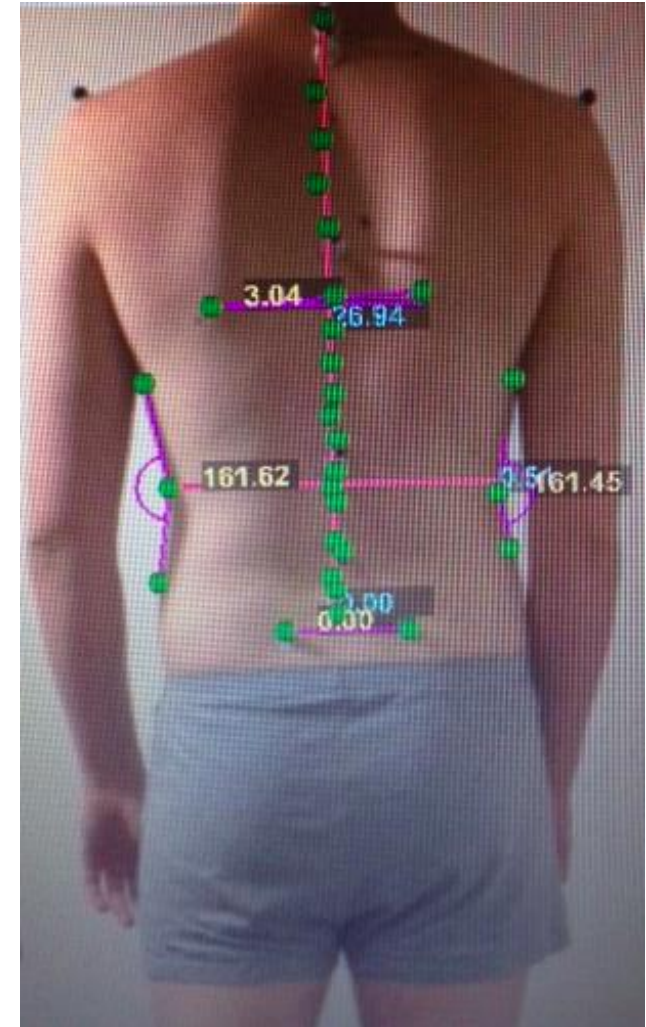


Literature search revealed commercial apps not tested for validity/reliability



Desk based software was assessed

Questions raised concerning use by researchers versus use by clinicians



Decision to build an app

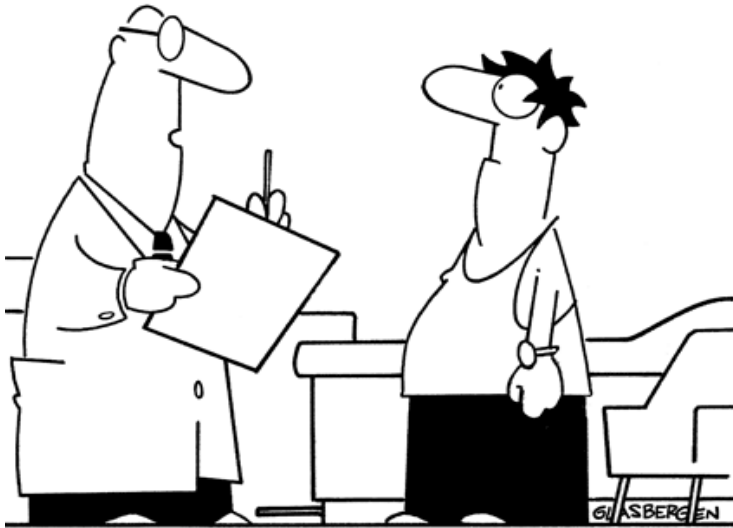


Survey of chiropractors was used to inform content of app

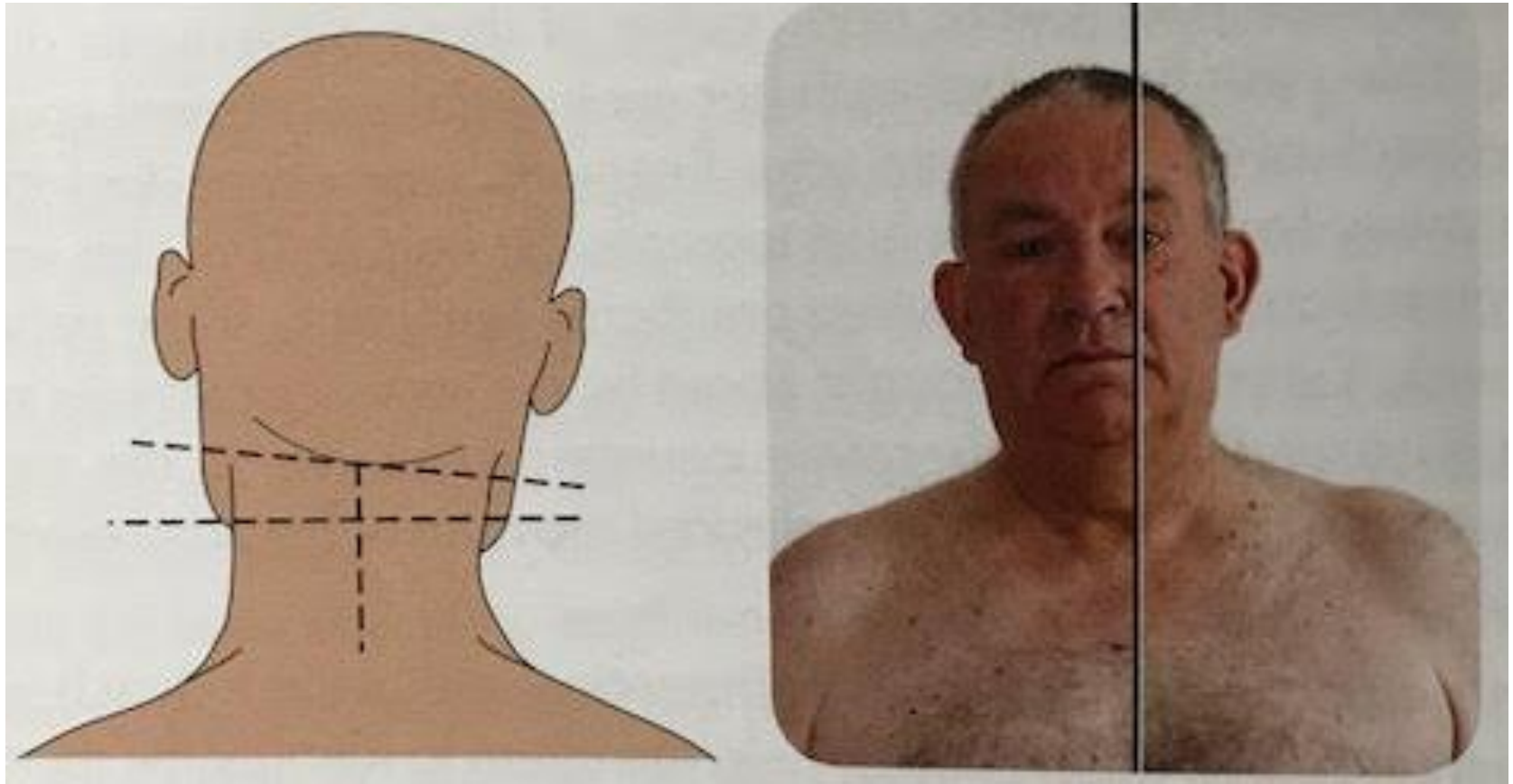


Postural indices

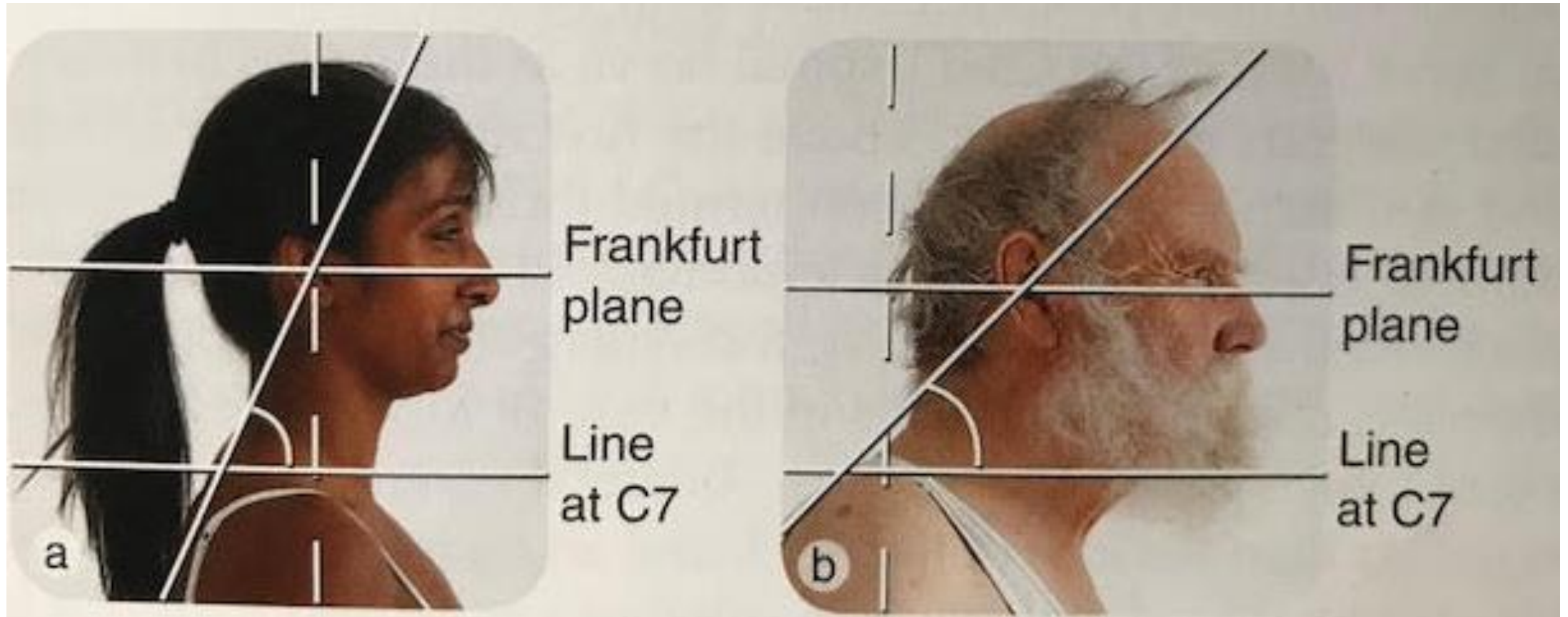
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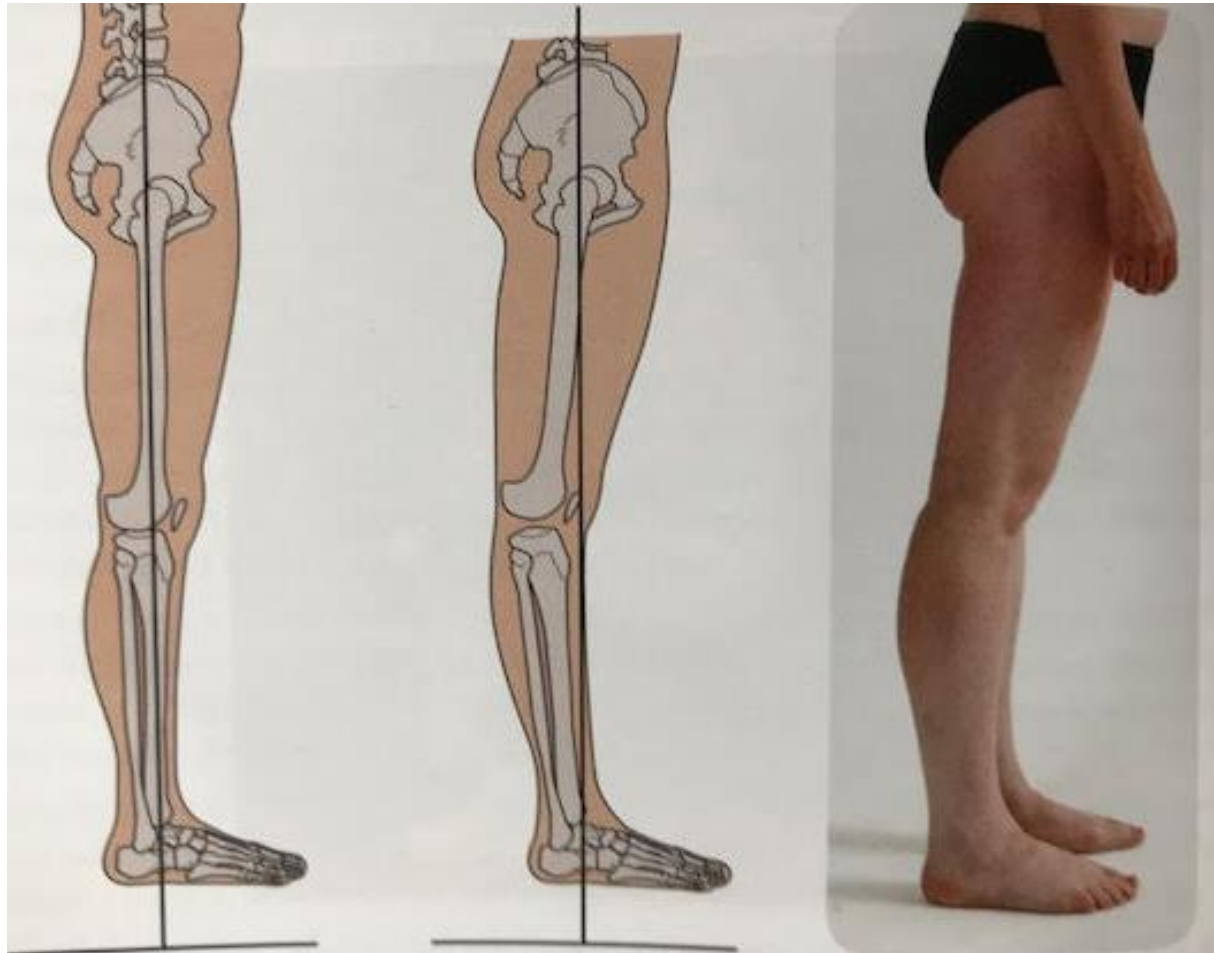
e.g. lateral flexion of the neck



e.g. forward head posture

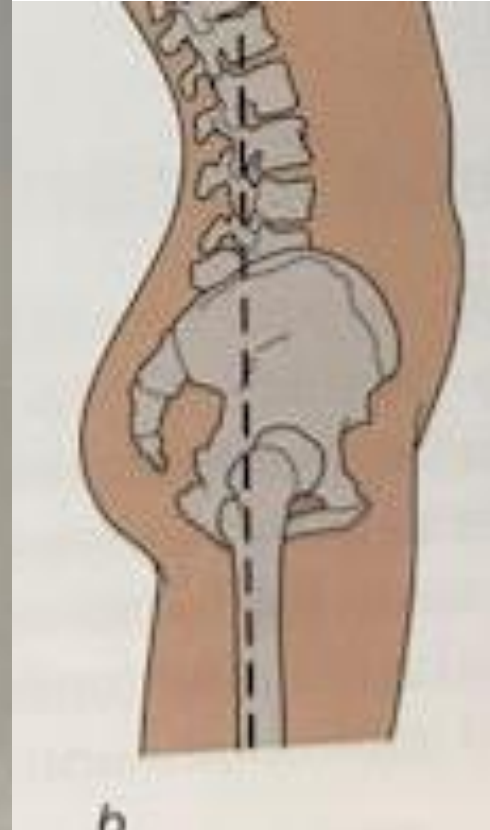
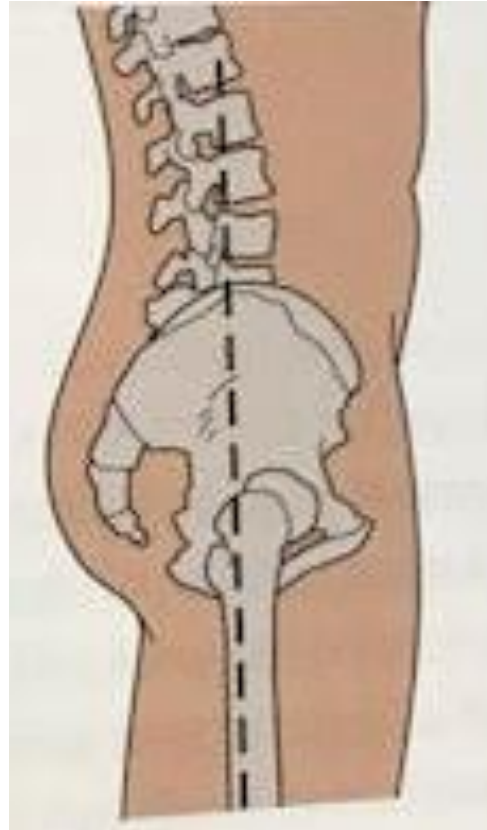


e.g. knee position - hyperextension



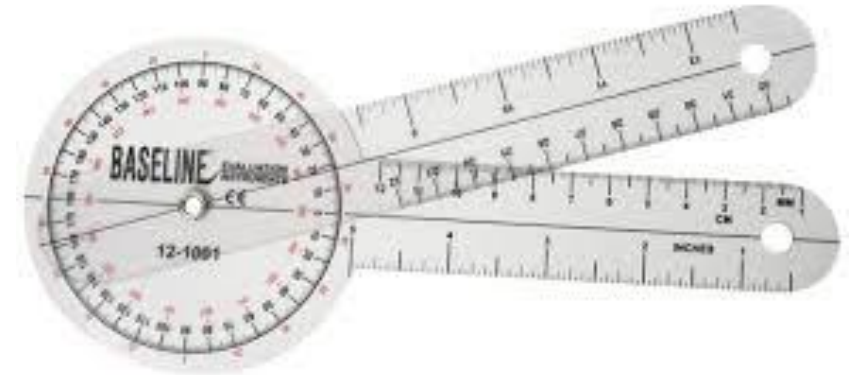
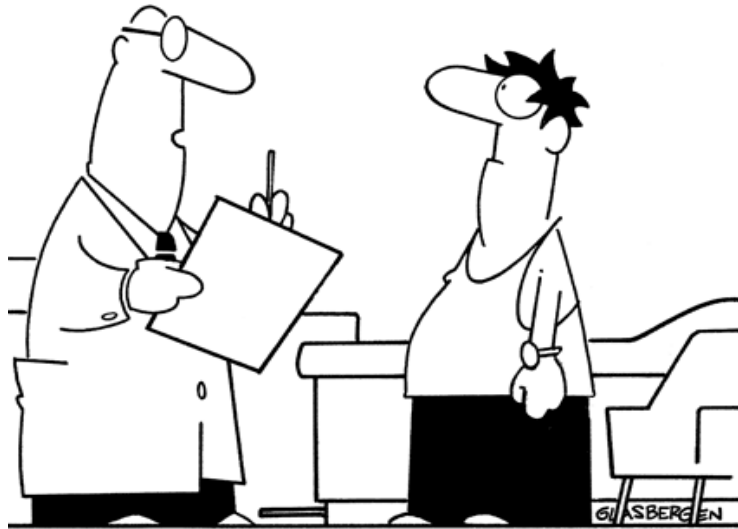
Problem

- How to translate what chiropractors say they observe (e.g kyphosis, lordosis, forward head posture) into meaningful measurements?



Decide how 49 postural descriptions would be translated into indices

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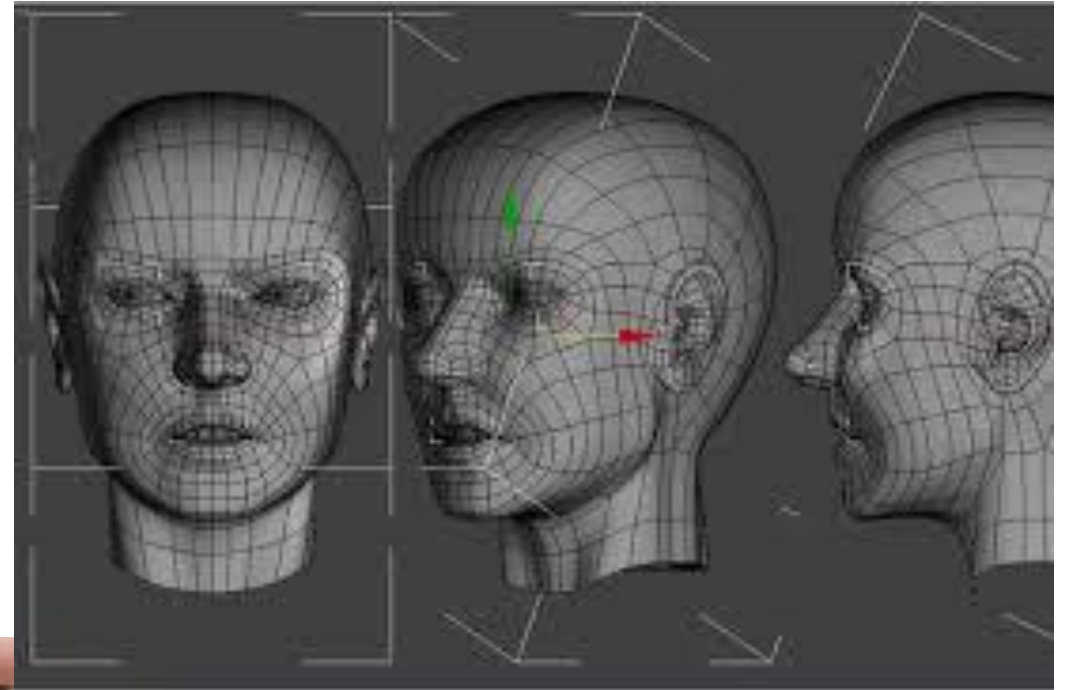


Decided to measure distances and angles between specific anatomical points



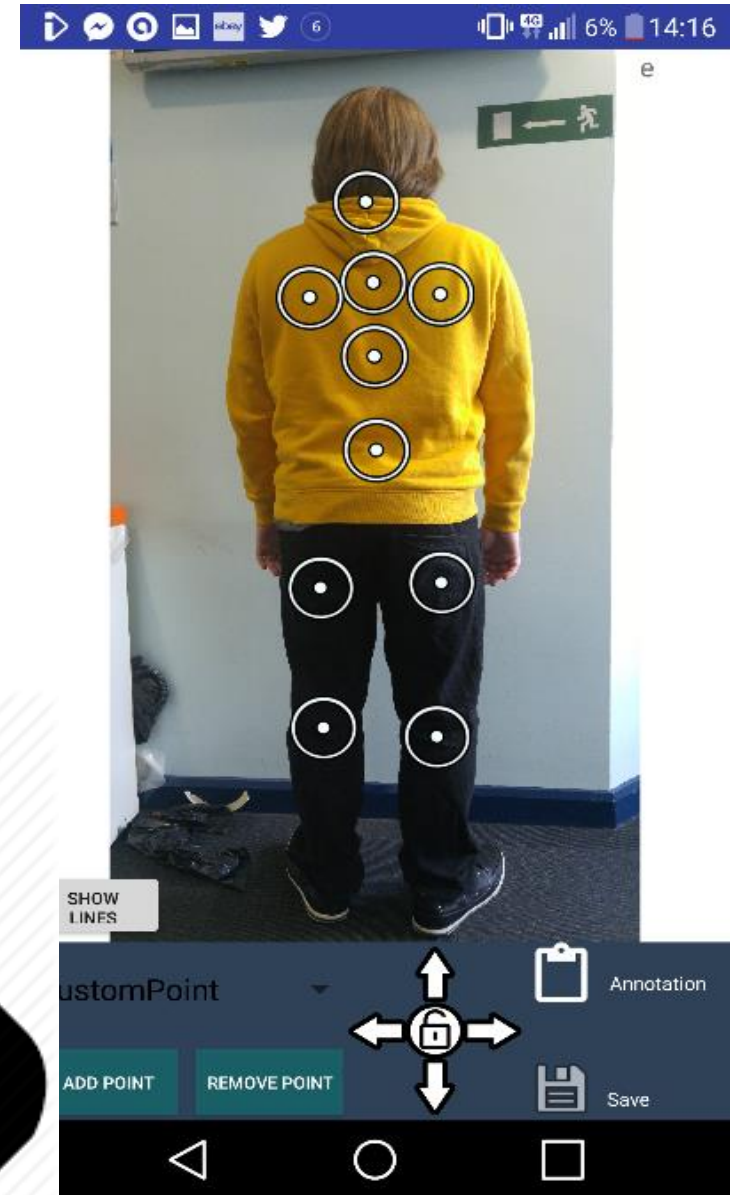
Considered options

- Automated - face recognition
- Outlines

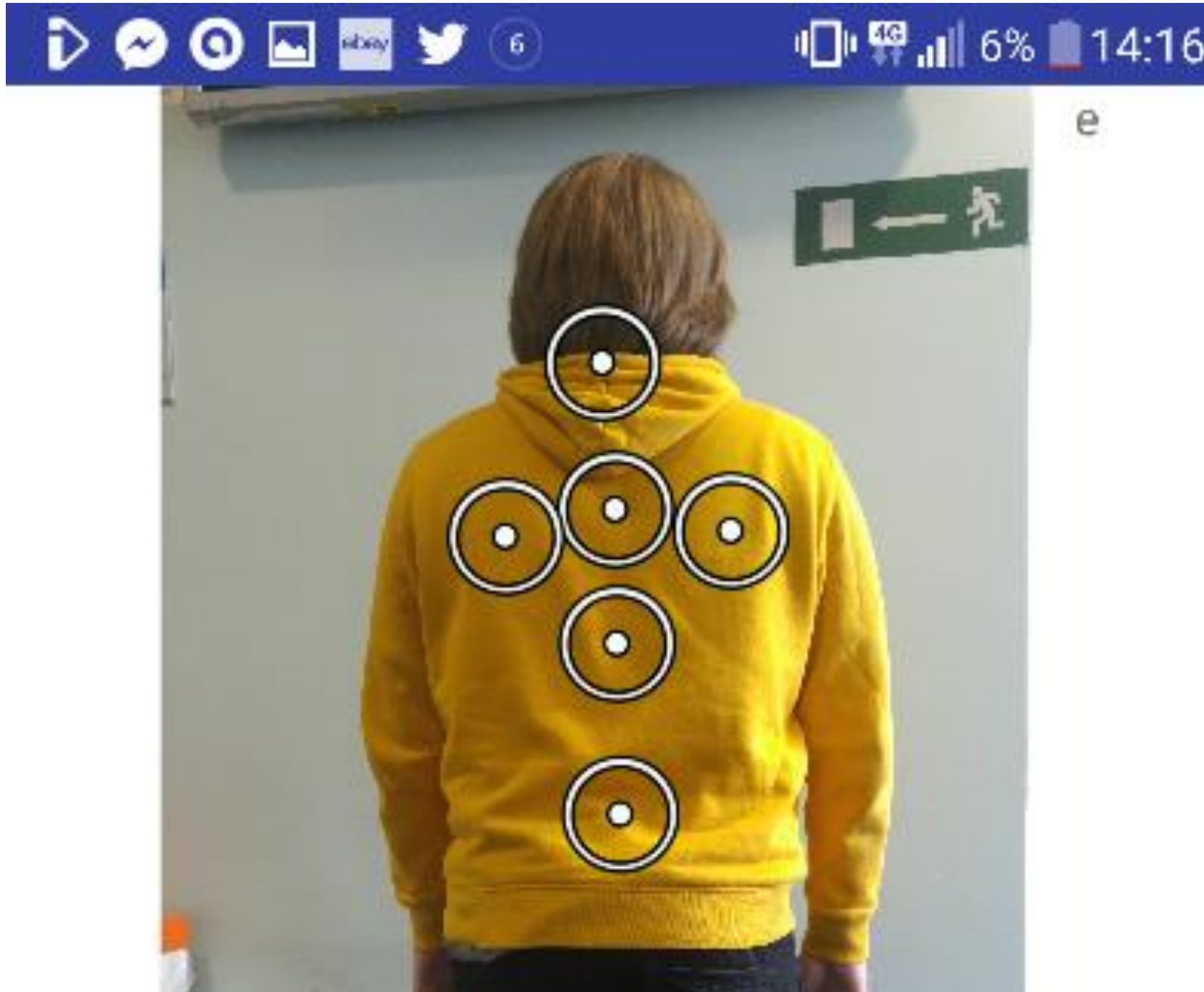


Programming team focused on

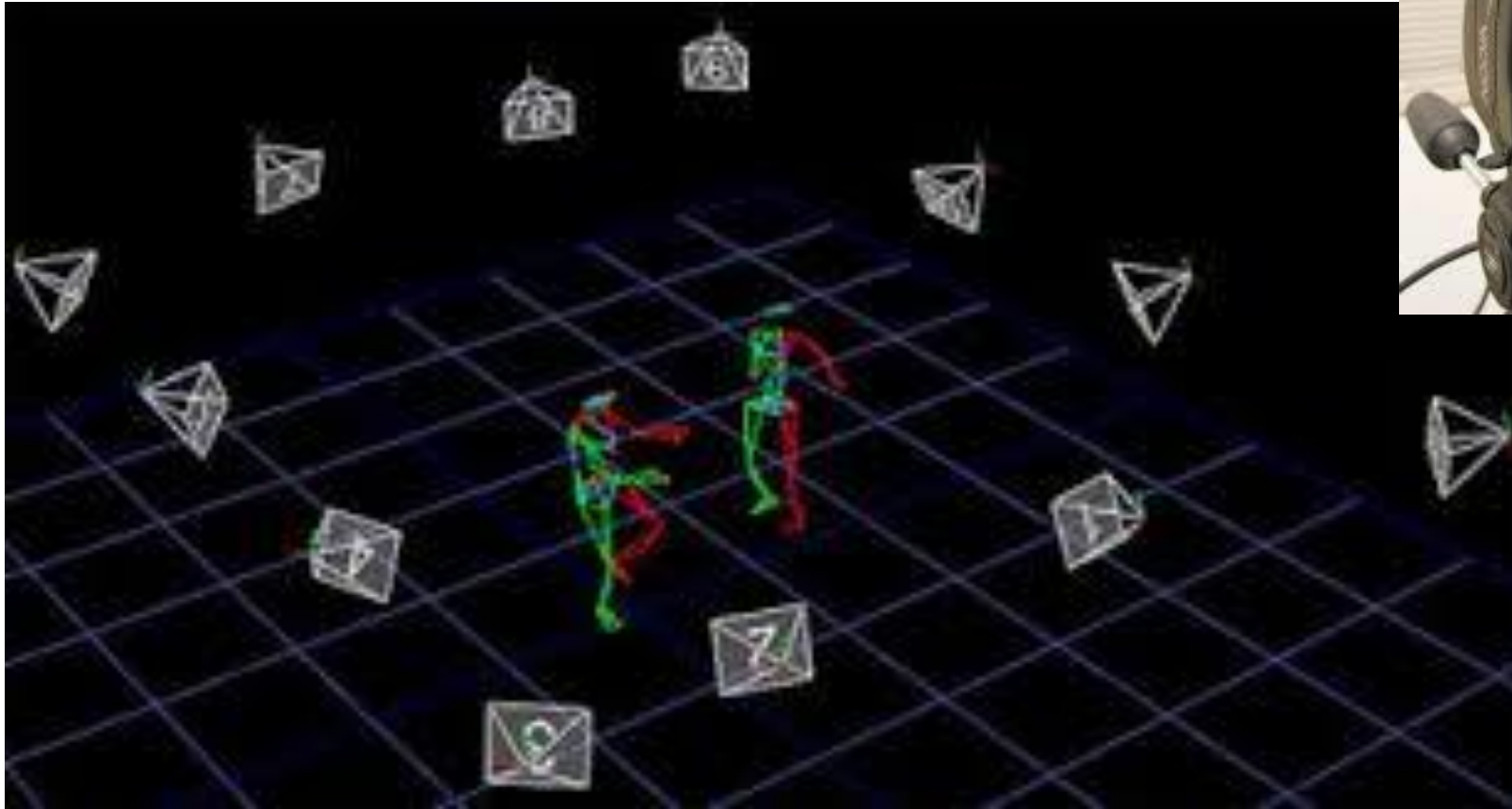
- ❑ Measuring distances between points.
- ❑ Measuring angles.
- ❑ Secure data storage.
- ❑ Speed of use.



The app automatically calculates distances between points, angles, and distances from a plumb line

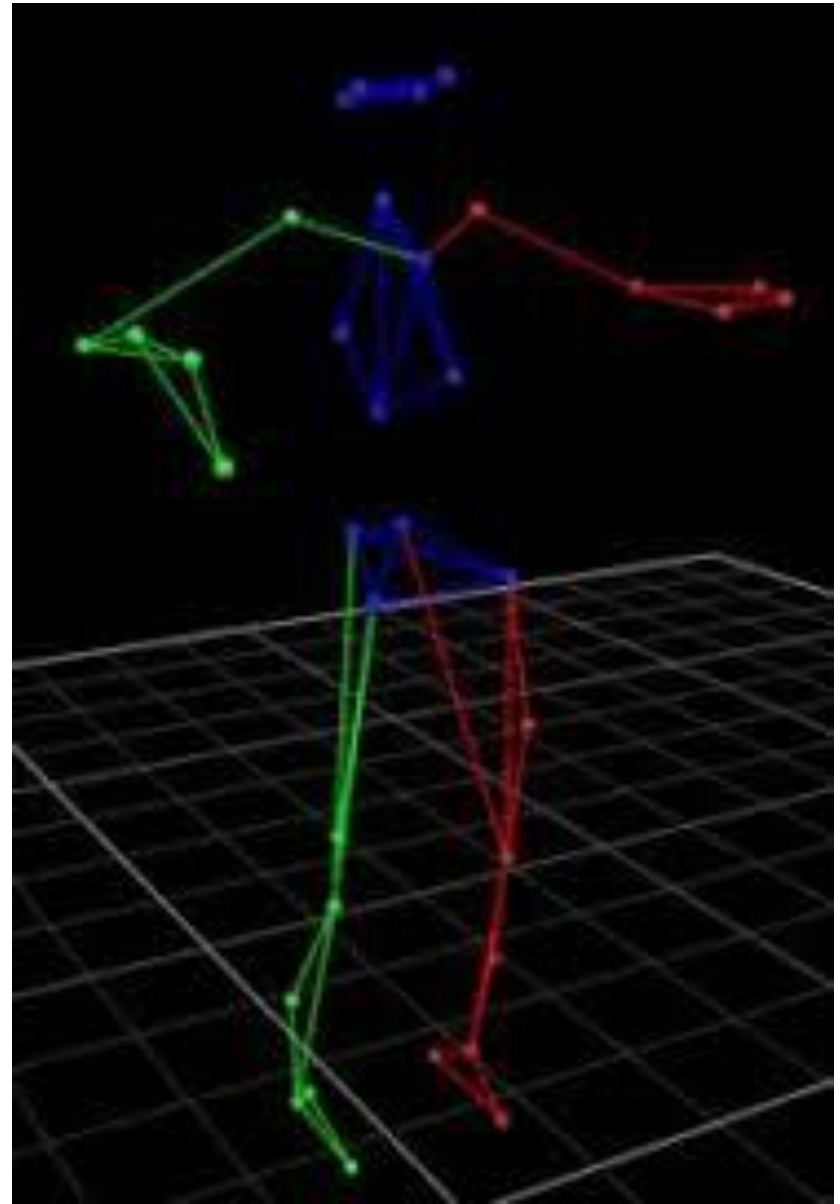
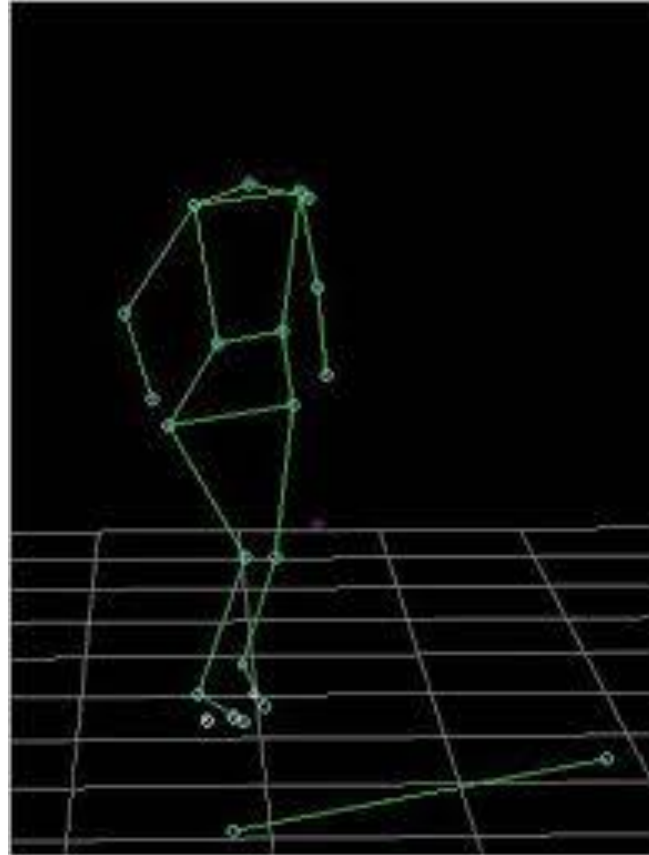


Validity testing against Vicon





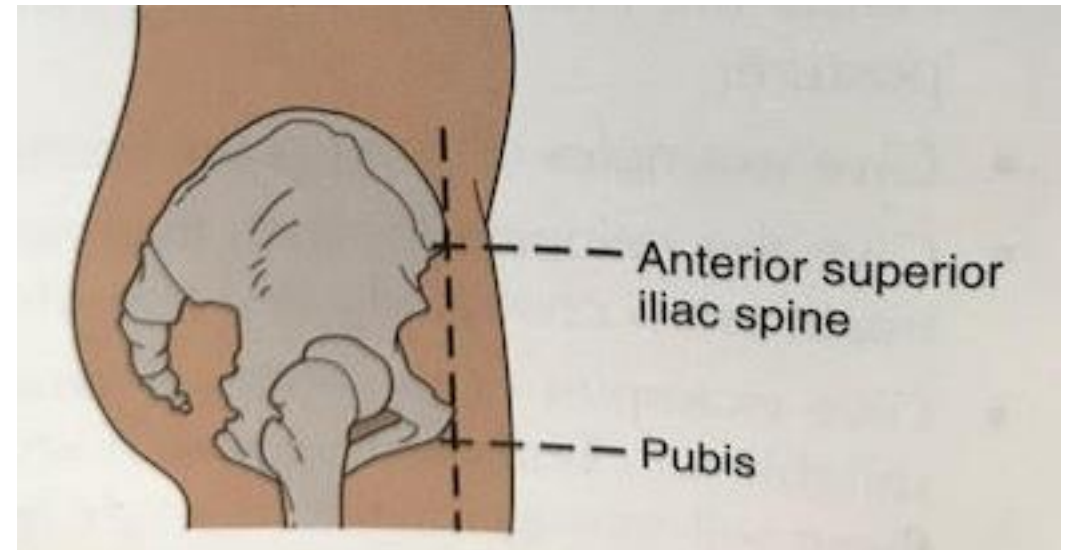
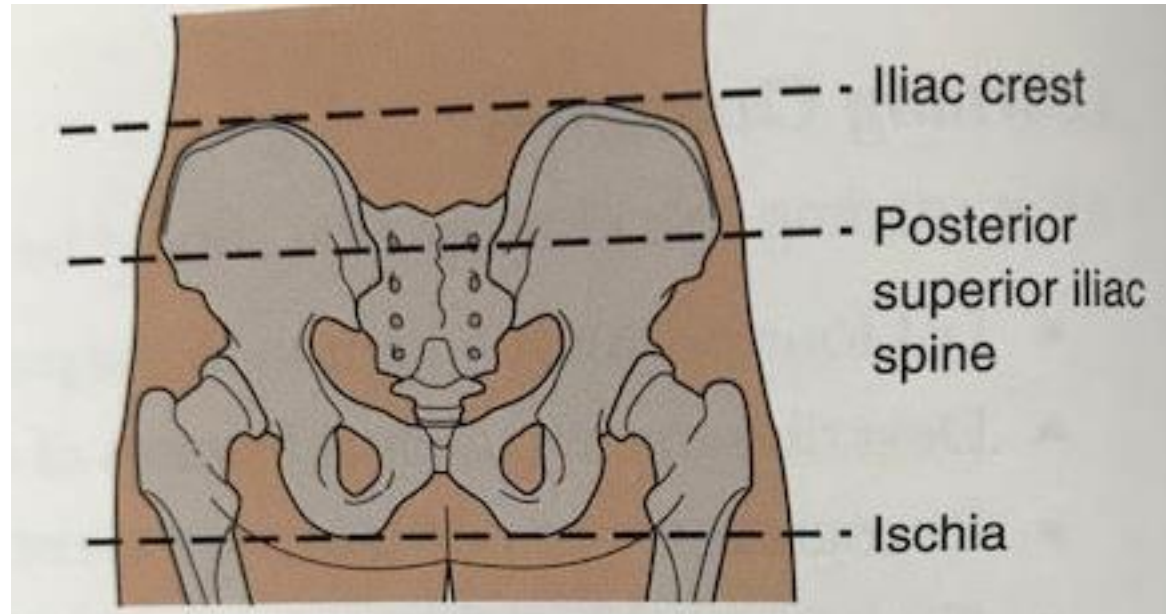
1. Build Vicon template





- Rehearsal of process
- Pilot study
- Data collection

Difficulties with point placement e.g. pelvic position









Participant features are visible

- Rigorous assessment of the application by the ethics committee.
- Participants consented to their features being visible.



6 postures: 4 views

	Normal (1)	Protracted head	Retracted head	Protracted scapula	Retracted scapula	Normal (2)
Front view						

Back view



Left-side
view



























Right-side
view



























For each participant 48 photos



MARKED, 4 views in each of 6 postures

	Normal (1)	Protracted head	Retracted head	Protracted scapula	Retracted scapula	Normal (2)
Front view						
Left-side view						
Right-side view						
Back view						

UNMARKED, 4 views in each of 6 postures

	Normal (1)	Protracted head	Retracted head	Protracted scapula	Retracted scapula	Normal (2)
Front view						
Left-side view						
Right-side view						
Back view						

• Normal



Protracted

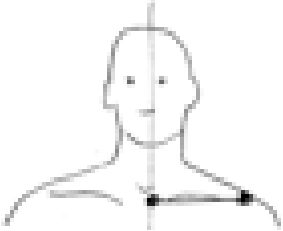
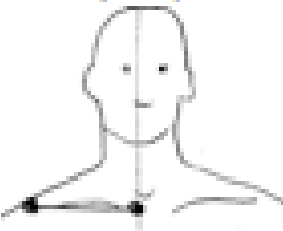


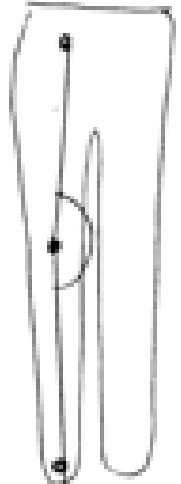
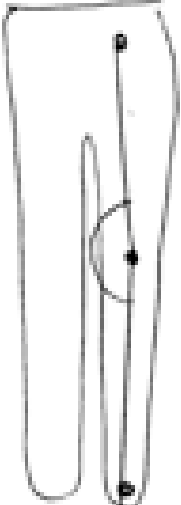
Retracted



Normal
Protracted head
Retracted head



<p>Distance of left AC joint from plumb line (cm).</p> 	<p>13.21 15.73 16.70</p>	<p>12.36 12.97 15.87</p>	<p>16.83 17.54 18.69</p>	<p>14.11 15.85 10.29</p>	<p>14.53 14.13 18.06</p>	<p>15.13 16.74 17.54</p>
<p>Distance of right AC joint from plumb line (cm).</p> 	<p>14.42 15.73 12.60</p>	<p>15.10 14.59 12.56</p>	<p>17.54 17.54 12.04</p>	<p>18.68 18.78 15.58</p>	<p>12.04 11.34 13.67</p>	<p>13.31 15.53 12.47</p>

<p>Genu valgum/vcarum angle left knee</p> 	<p>175.17 176.95 176.93</p>	<p>136.79 177.61 176.93</p>	<p>177.17 177.15 176.97</p>	<p>176.95 176.93 177.0</p>	<p>176.94 176.94 176.95</p>	<p>176.97 176.94 176.97</p>
<p>Genu valgum/varum angle right knee</p> 	<p>176.88 176.94 176.94</p>	<p>177.56 177.56 176.91</p>	<p>177.13 177.10 176.88</p>	<p>176.88 176.90 176.94</p>	<p>176.87 176.91 176.86</p>	<p>176.89 176.91 176.90</p>

I'm curious and excited about the results

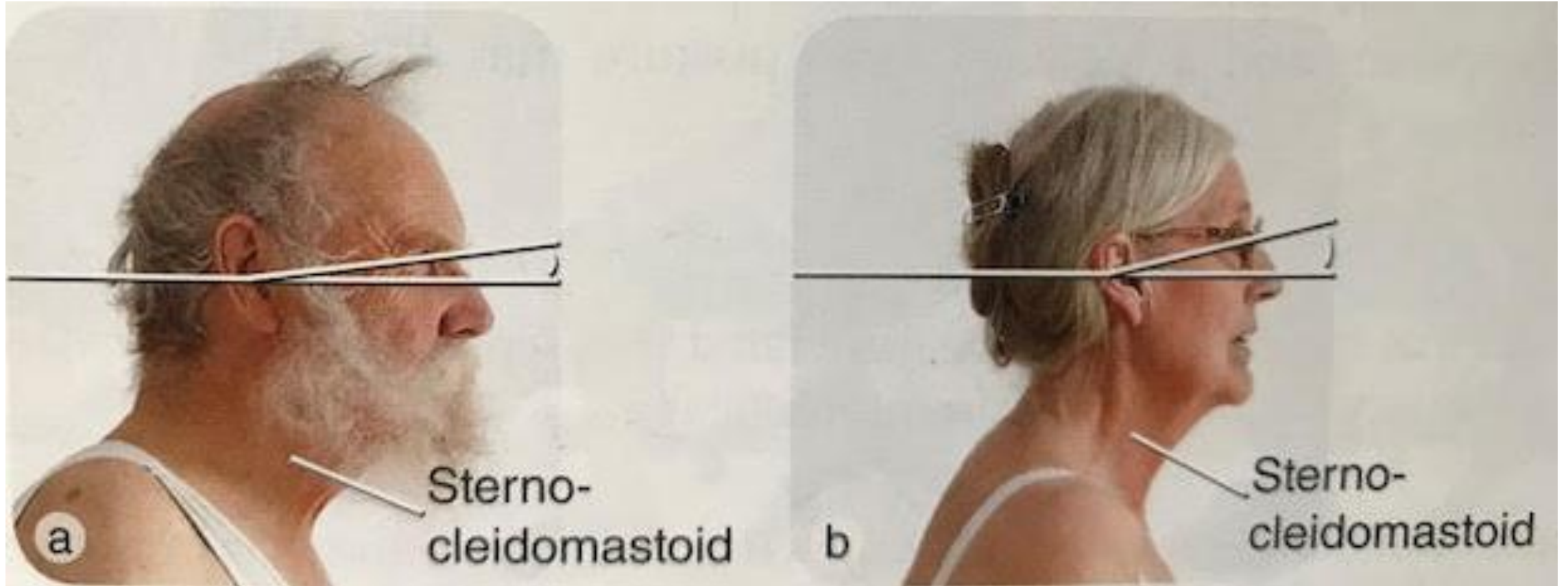


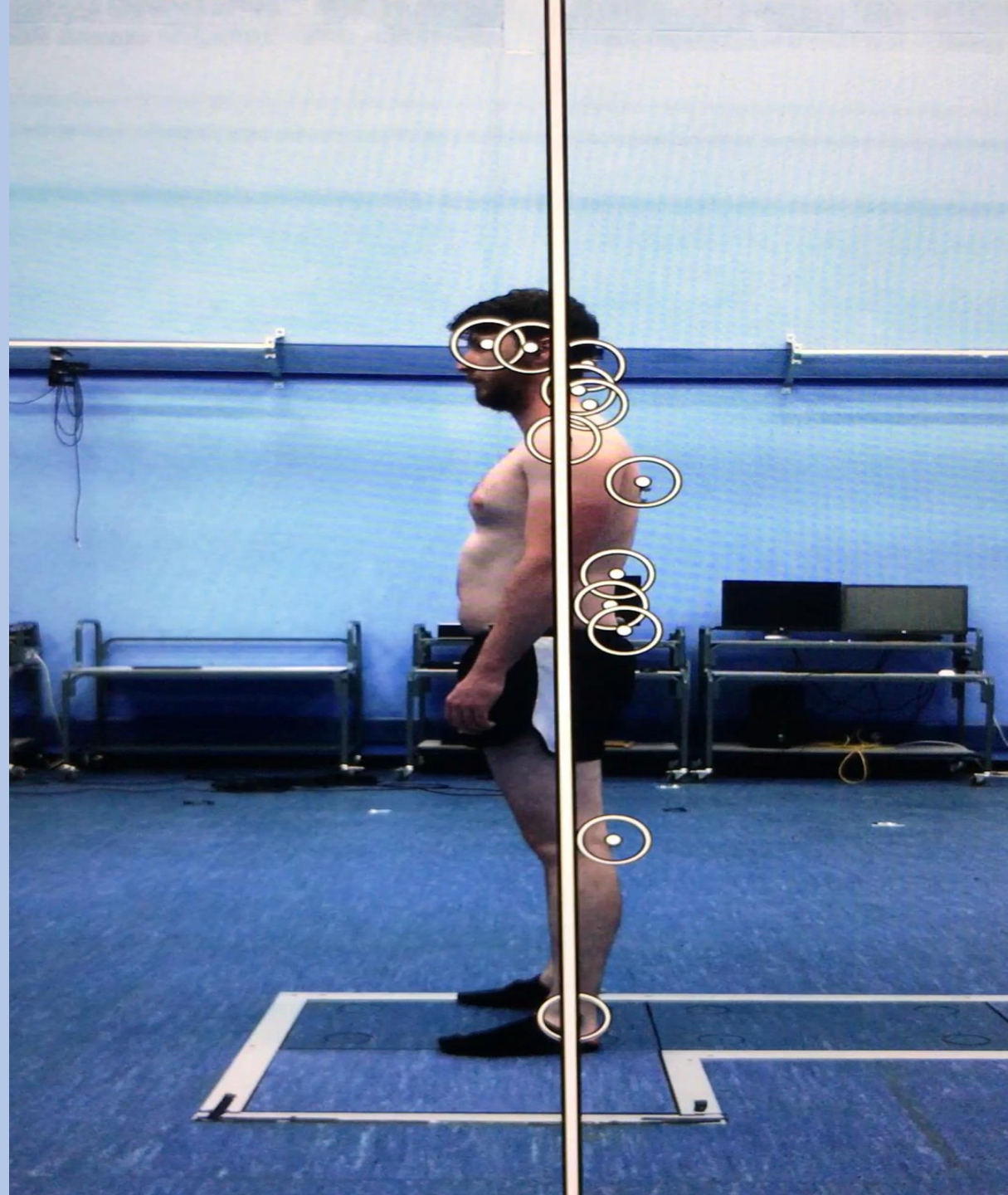
Potential for secondary data analysis

- E.g. pelvic rotation



e.g. excursion angle





Measuring Posture objectively using a low cost 3D mobile App



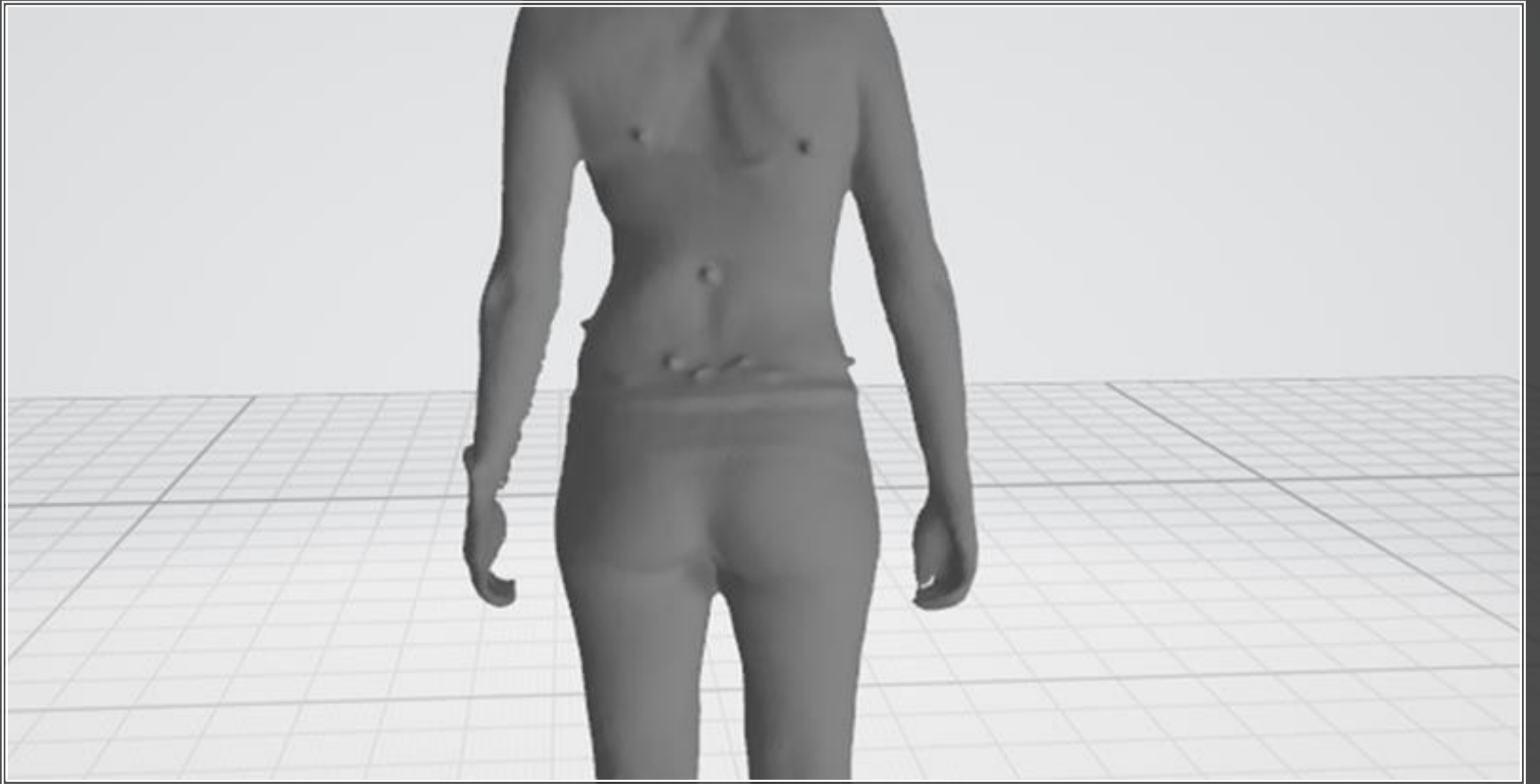
The Structure Sensor™

- ❖ An iPad based 3D mobile scanning tool
- ❖ Consists of an infra-red (IR) camera and IR projector
- ❖ These are designed to be incorporated into both iPads and iPhones

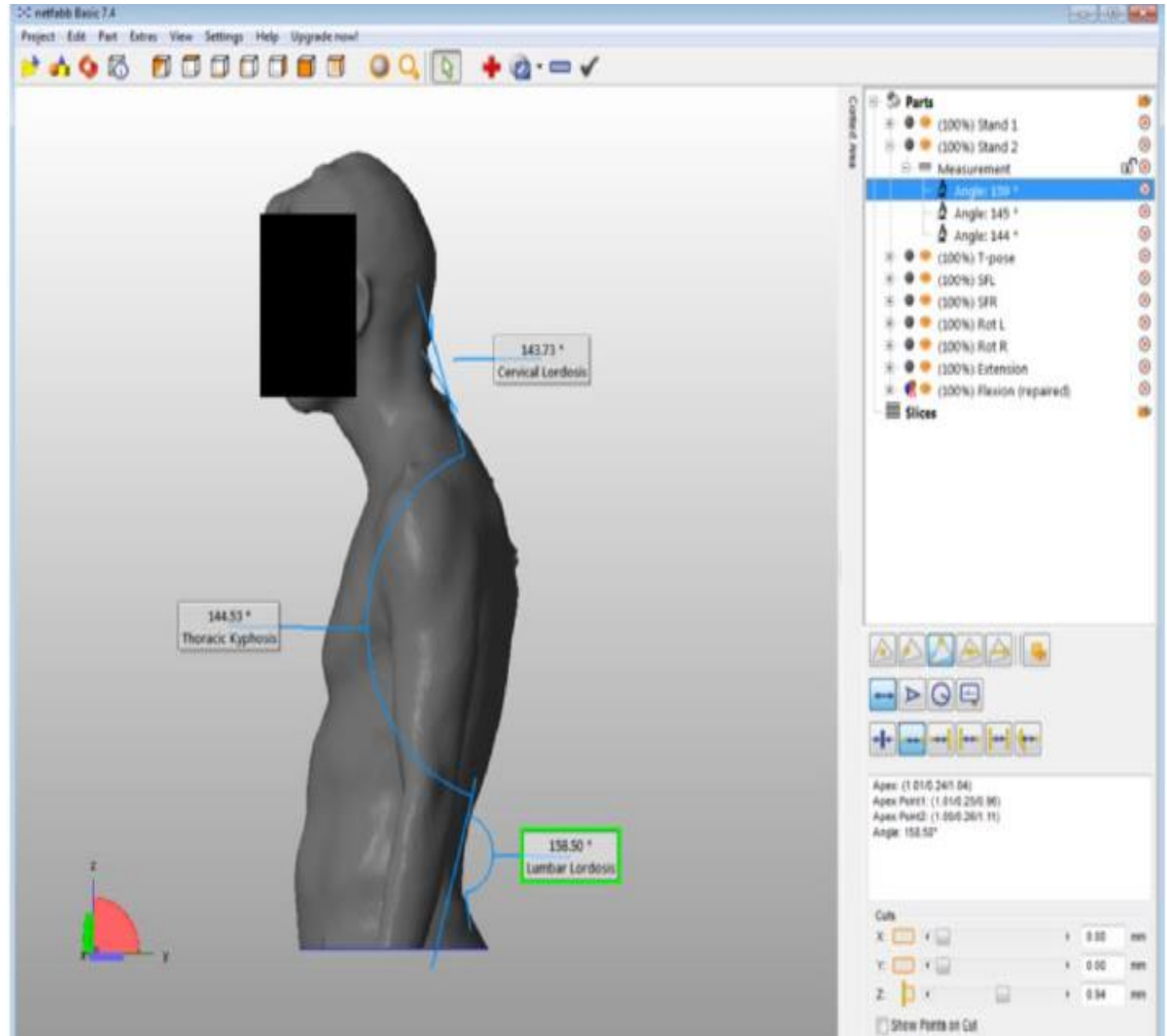


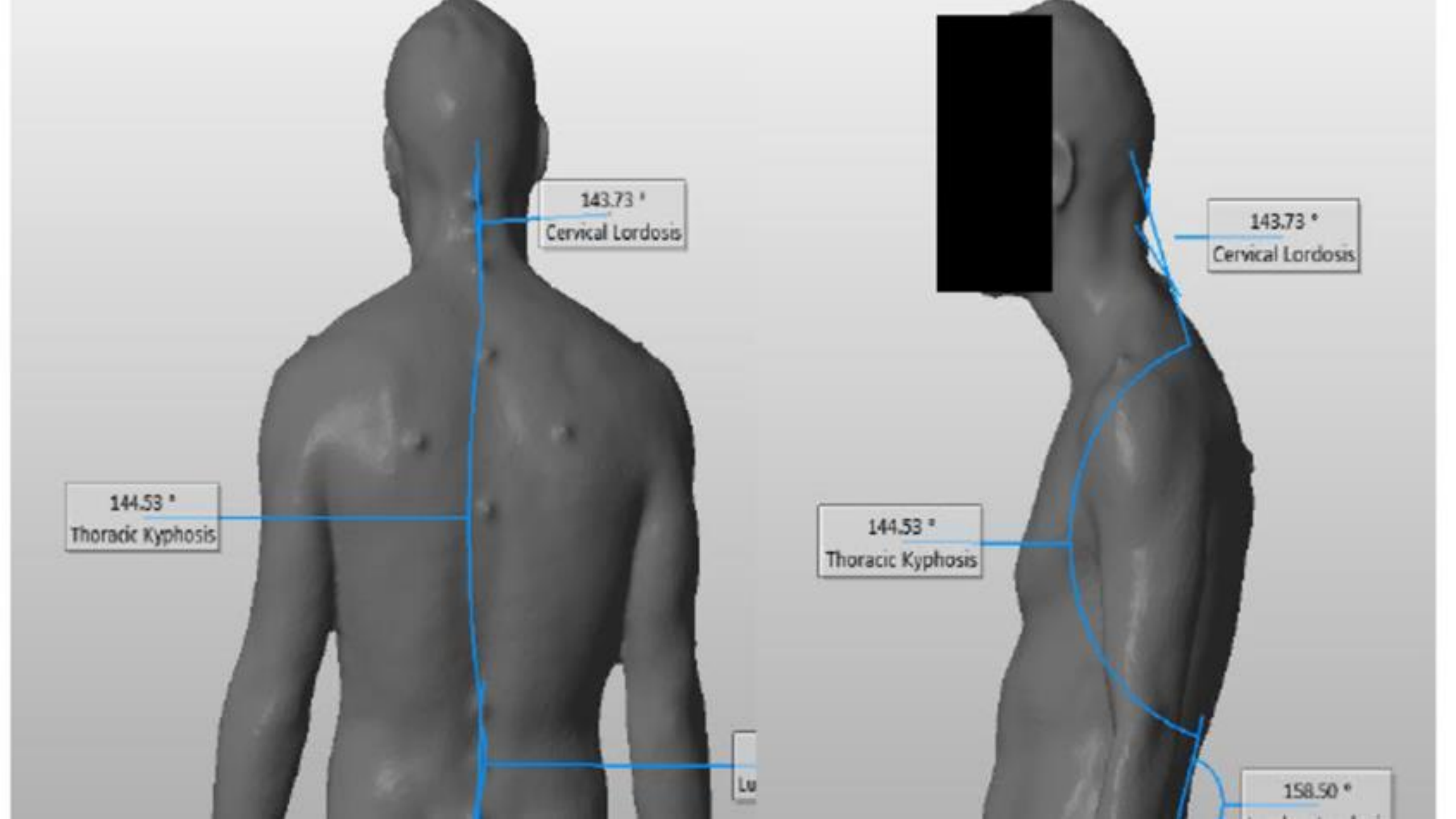
Data processing





Measuring body angles and distances





144.53 °
Thoracic Kyphosis

This image shows a 3D anatomical model of a human back and neck. The model is rendered in a dark grey color. Blue lines are drawn along the spine to indicate the curvature of the cervical, thoracic, and lumbar regions. Callout boxes with white backgrounds and black text provide the specific angle for each curvature. The cervical lordosis is 143.73 degrees, the thoracic kyphosis is 144.53 degrees, and the lumbar lordosis is 158.50 degrees. The head is obscured by a black rectangular box in the side view.

143.73 °
Cervical Lordosis

144.53 °
Thoracic Kyphosis

143.73 °
Cervical Lordosis

158.50 °
Lumbar Lordosis

Lu

Thanks for
listening

