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
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 of 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
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.
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
Usually features are obscured
Participant features are visible

• Rigorous assessment of the application by the ethics committee.

• Participants consented to their features being visible.
### 6 postures: 4 views

<table>
<thead>
<tr>
<th>Front view</th>
<th>Normal (1)</th>
<th>Protracted head</th>
<th>Retracted head</th>
<th>Protracted scapula</th>
<th>Retracted scapula</th>
<th>Normal (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
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<td><img src="image6.png" alt="Image" /></td>
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</tbody>
</table>
Back view
Left -side view
For each participant 48 photos
• Normal
• Protracted
• Retracted
Normal
Protracted head
Retracted head
<table>
<thead>
<tr>
<th>Distance of left AC joint from plumb line (cm)</th>
<th>13.21</th>
<th>15.73</th>
<th>16.70</th>
<th>12.36</th>
<th>12.97</th>
<th>15.87</th>
<th>16.83</th>
<th>17.54</th>
<th>18.69</th>
<th>14.11</th>
<th>15.85</th>
<th>10.29</th>
<th>14.53</th>
<th>14.13</th>
<th>18.06</th>
<th>17.54</th>
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<tbody>
<tr>
<td>Distance of right AC joint from plumb line (cm)</td>
<td>14.42</td>
<td>15.73</td>
<td>15.10</td>
<td>12.60</td>
<td>14.59</td>
<td>12.56</td>
<td>17.54</td>
<td>12.04</td>
<td>12.04</td>
<td>18.68</td>
<td>18.78</td>
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<td>12.04</td>
<td>13.67</td>
<td>15.53</td>
<td>13.31</td>
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<tr>
<td>Genu valgum/varum angle left knee</td>
<td>175.17</td>
<td>136.79</td>
<td>177.17</td>
<td>176.95</td>
<td>176.94</td>
<td>176.97</td>
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<thead>
<tr>
<th>Genu valgum/varum angle right knee</th>
<th>176.88</th>
<th>177.56</th>
<th>177.13</th>
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<th>176.87</th>
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<td>176.86</td>
<td>176.90</td>
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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
Thanks for listening