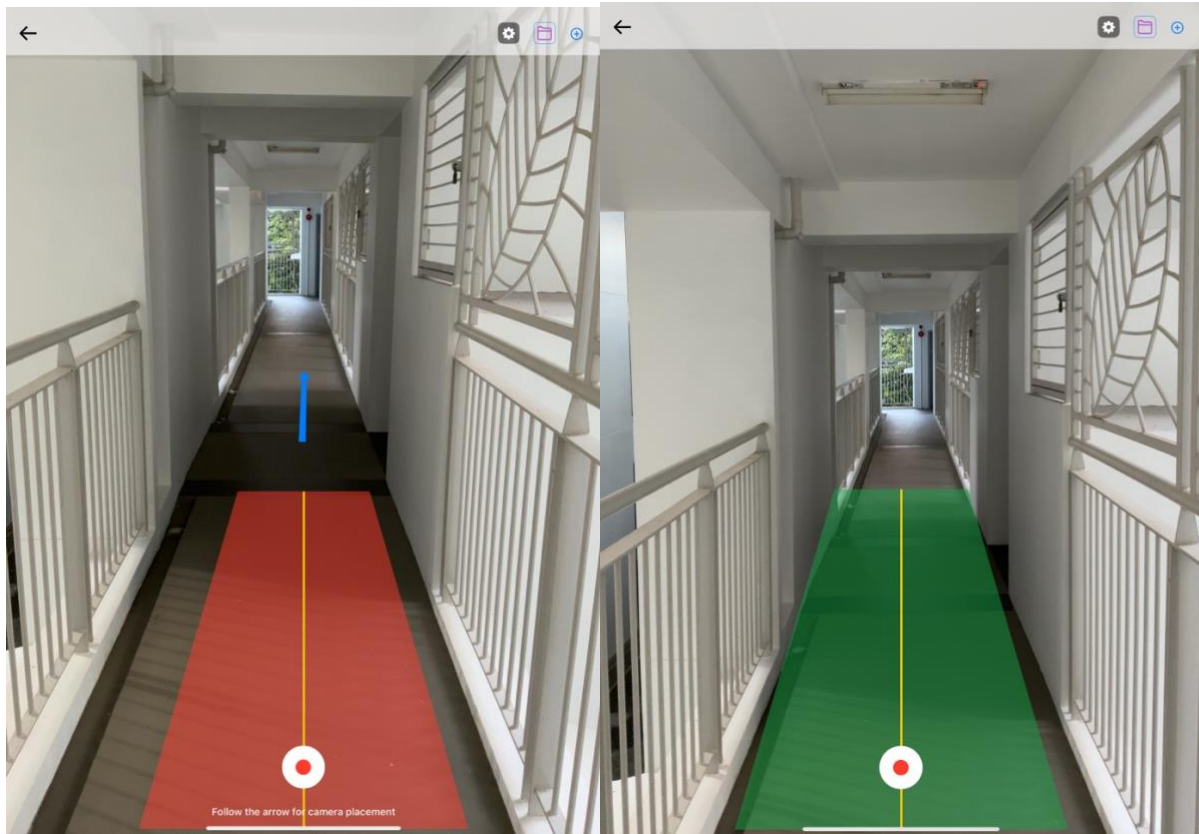
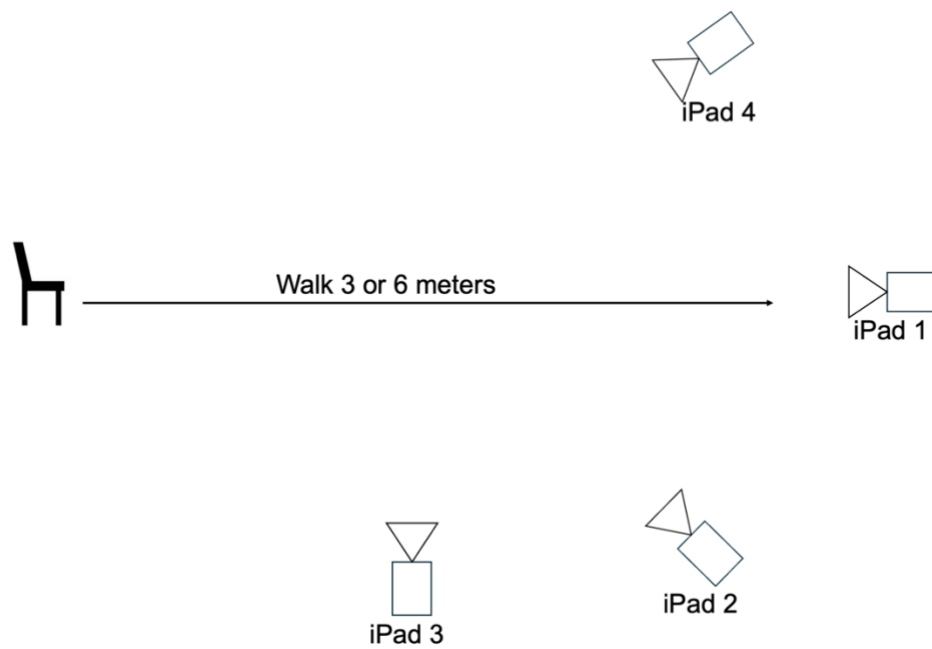


## Supplementary Materials

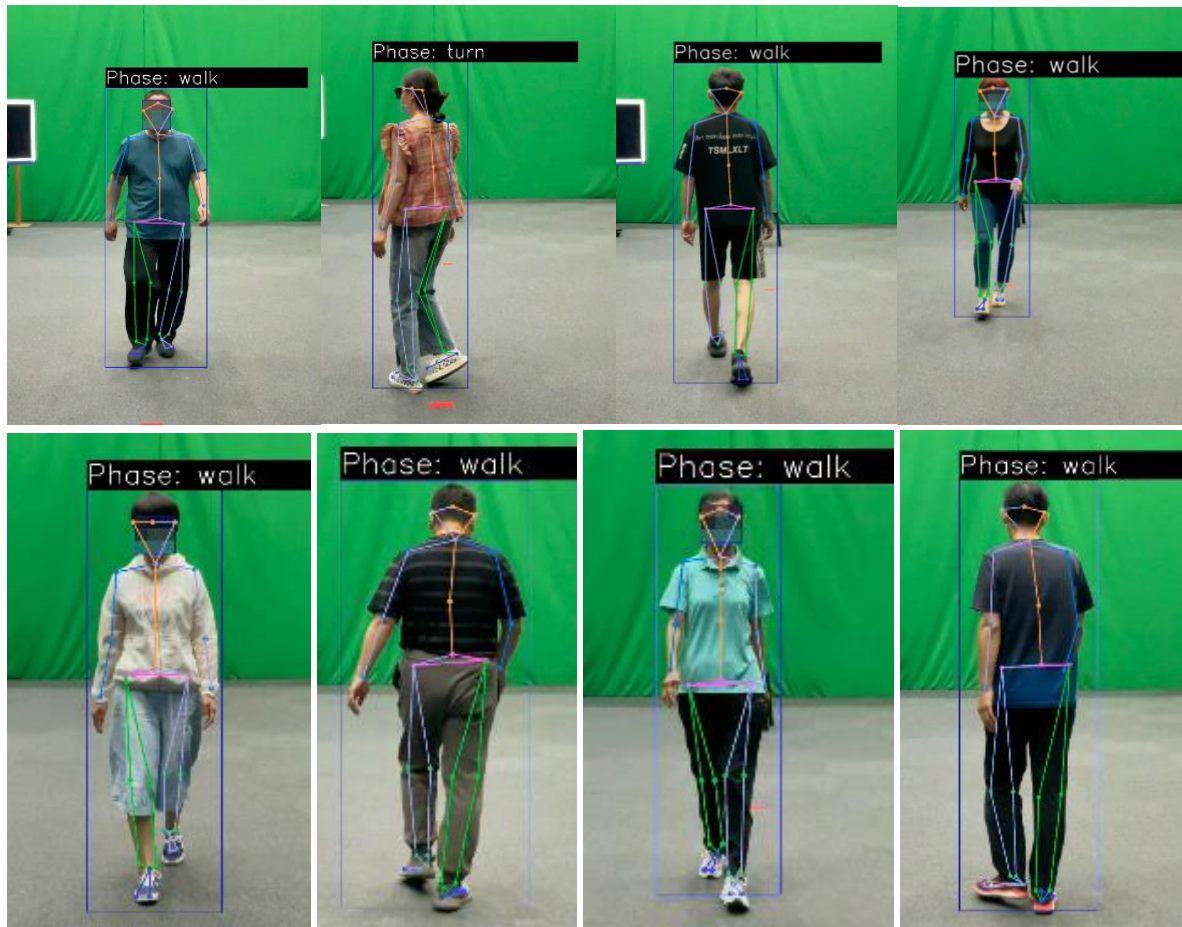


**Supp. Figure 1.** Example screenshots of the video acquisition screen in our application, showing a track overlay to indicate where user should stand and walk, and an arrow for how to adjust the pitch and yaw of the camera. Camera is set up correctly and ready for video acquisition when the arrow disappears, and the track turns green.



**Supp. Fig. 2.** Experimental set up showing the positions of the iPads. Only data from the front facing camera iPad 1 is used for testing.

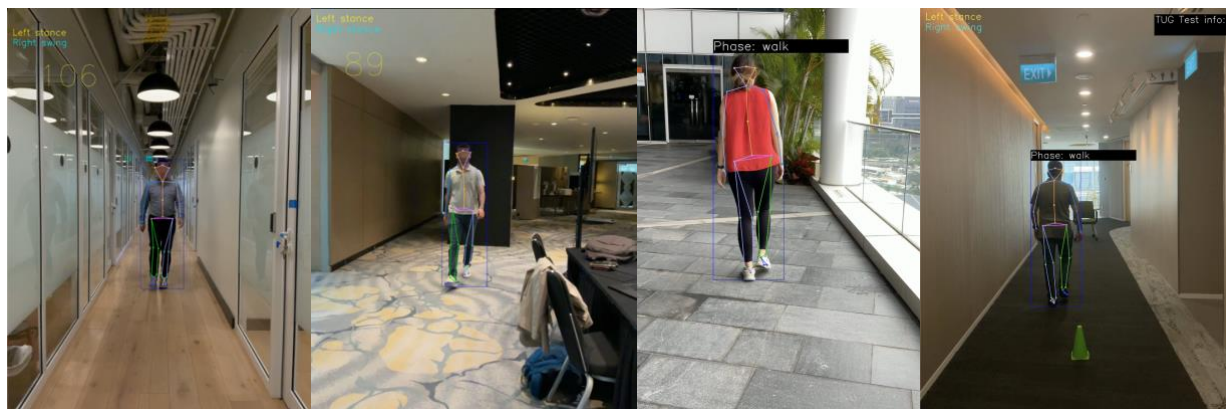
(a)



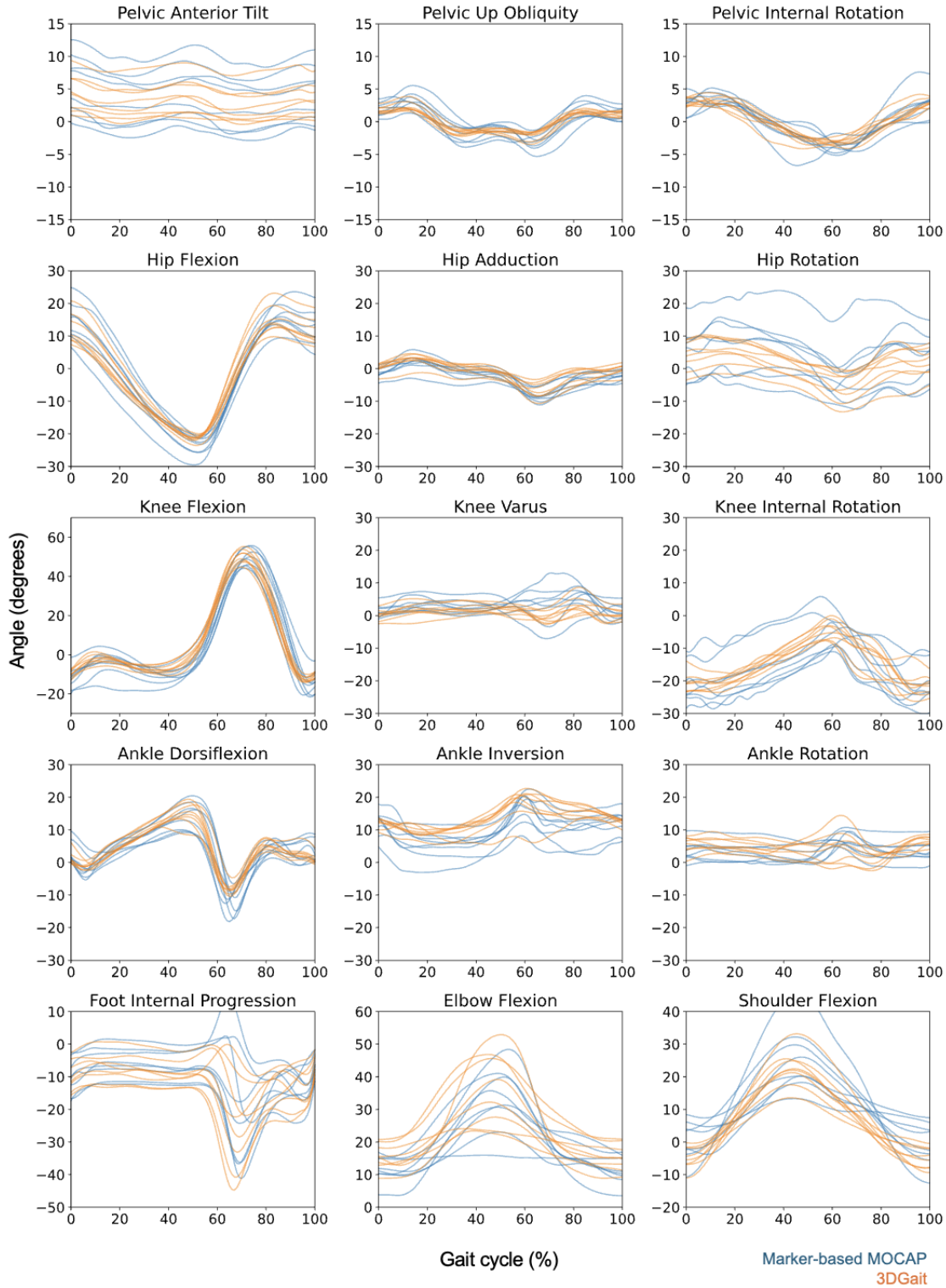
(b)



(c)



**Supp. Figure 3.** Example images with inferred 2D pose key points overlaid on (a) subjects in everyday clothing, (b) the MS-COCO validation set, and (c) additional images captured in varied environments and lighting conditions.



**Supp. Figure 4.** Joint kinematics during the gait cycle, derived from the marker-based MoCap system (OptiTrack, blue) and from our single camera markerless system (3DGait, orange). Each line represents one (out of 8) subject's average.

**Supp. Table 1.** Recommended working conditions for 3DGait

| <b>Parameter</b>     | <b>Recommended working range</b>                                                            | <b>Notes</b>                                                                         |
|----------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Camera height        | 1.2 – 1.6 m                                                                                 | Measured from ground to center of camera lens                                        |
| Camera distance      | 2 – 10 m                                                                                    | Measured from subject to camera lens                                                 |
| Camera angle         | Camera facing direction of walking path<br>Pitch 80 to 91 degrees<br>Yaw -10 to +10 degrees | See Supp. Fig. 1 for example user interface that guides camera and subject placement |
| Lighting conditions  | Indoor/ outdoor with even lighting                                                          | Avoid direct glare or harsh shadows                                                  |
| Participant clothing | Most regular clothing with limb visibility                                                  |                                                                                      |

**Supp. Table 2.** Hyperparameters of the 2D and 3D pose estimation model within 3Dgait.

| Hyperparameter                 | 2D pose                                                                                     | 3D pose                                                        |
|--------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Weight initialization          | MS-COCO                                                                                     | Zeros                                                          |
| Optimizer                      | Adam                                                                                        | Adam                                                           |
| Batch size                     | 128                                                                                         | 4096                                                           |
| Number of epochs               | 150                                                                                         | 100                                                            |
| Initial learning rate          | 0.03                                                                                        | 0.001                                                          |
| Learning rate schedule         | Learning rate reduced by a factor of 10 at the 90 <sup>th</sup> and 120 <sup>th</sup> epoch | Exponential decay, with rate decaying by 0.95 every epoch      |
| Regularization                 | Weight decay 0.0001                                                                         | Dropout 0.25                                                   |
| Loss function                  | Mean Squared Error                                                                          | Weighted Mean Absolute Error                                   |
| Training framework             | Tensorflow 2.10                                                                             | Tensorflow 2.17                                                |
| Training system                | MacOS (M1 Max, Apple Inc., CA, USA)                                                         | Linux with NVIDIA (CA, USA) GTX 3090 Graphical Processing Unit |
| Number of trainable parameters | 7.4 million                                                                                 | 8.8 million                                                    |