MEASUREMENT OF CENTRE OF PRESSURE IN THE STANDING SUBJECT: AN ALTERNATIVE TO FORCE PLATFORMS

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Problem

Centre of pressure (COP) measurement in the standing subject

- Force platforms
- Not portable
- Lab based
- In-field or on-site testing impossible

Specifically, measure COP at the golf course whilst subject is putting on the green

Alternate system

Develop lightweight and portable COP measurement system that does not interfere with "performance" environment

- Pliance® mat
- 39.2cm x 39.2 cm
- 256 sensors
- Rubberised surface
- 5 mm thick

Collect validation data

Validate COP measurements from pliance® mat against known COP measurement standard

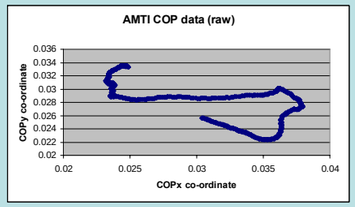
- Mat on top of AMTI plate
- Biomechanics laboratory
- 38Hz pliance v 500Hz AMTI
- Peak-to-peak amplitude
- COPx,y

Assess and filter data

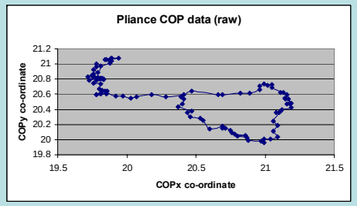
33 trials, various activities
COP movement – small to large
Data filtered at 5Hz
Sigview 32 v1.9.1.0 signal analysis software

Raw data example

AMTI

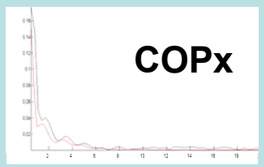


Pliance

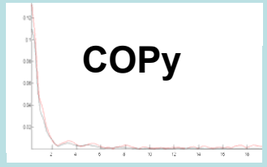


FFT output

COPx

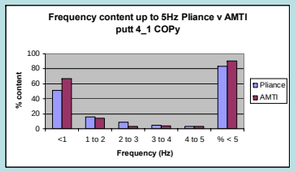


COPy

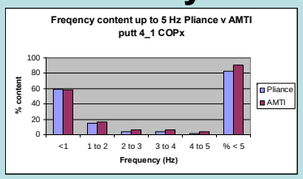


Signal content

COPx

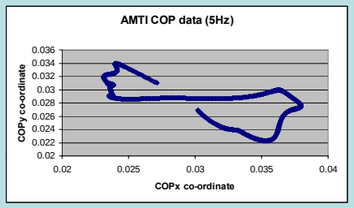


COPy

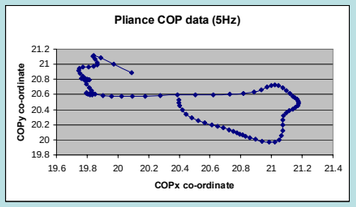


Smoothed data (5Hz)

AMTI



Pliance



Test of equality

non-central F test (Londoree et al.,1990)
Calculate:
Practical difference (PD) in mean values (eg. 1%)

$$d = \frac{[PD]}{\delta\sqrt{\frac{1}{n_1} - \frac{1}{n_2}}}$$

Non centrality parameter (ϕ) = d/$\sqrt{2}$
One-way ANOVA output (*F, df*)
R Statistical Computing v1.9.0
Significantly equal??

Results

Mean overall differences between pliance and AMTI
COPx = 0.65mm, COPy = 0.38mm

Parameters (n=33)	*M (mm)*	*SD (mm)*	*PD (mm)*	*d*	*ϕ*	*F calc*	*p*
COPx (ML)	*48.2*	*71.9*	*0.48*	*0.03*	*0.02*	*0.00*	*0.03*
COPy (AP)	*16.8*	*13.6*	*0.17*	*0.05*	*0.04*	*0.00*	*0.01*

Discussion and conclusion

Accuracy of pliance® mat in measurement of COPx,y peak-to-peak amplitude acceptable to within 1%

Portable, lightweight and accurate system available for assessment of COP in the field