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Accuracy of physical activity recognition from a wrist-worn sensor

Dr Kay Cooper[1], Dr Sadiq Sani[2], Liam Corrigan[1], Haley MacDonald[1], Chris Prentice[1], Rob Vareta[1], Dr Stewart Massie[2], Professor Nirmalie Wiratunga[2]
[1]School of Health Sciences & [2]School of Computing Science & Digital Media, Robert Gordon University, Aberdeen, UK

Purpose

Thigh-mounted sensors previously shown to be accurate for single-sensor physical activity monitoring
but
Long-term adherence to physical activity monitoring may be enhanced by the use of wrist-mounted sensors
so
Need accurate and easy-to-wear method of physical activity monitoring for SELFBACK – study developing & testing decision support system for low back pain self-management
Aim
To determine the accuracy of physical activity recognition via wrist-mounted sensors compared to thigh-mounted sensors

Participants

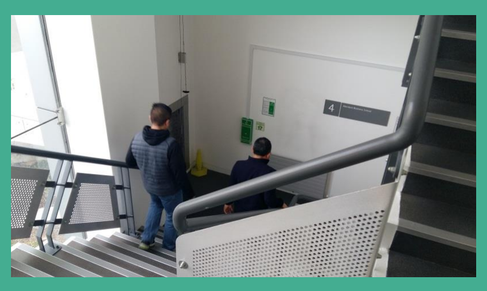
34 healthy volunteers
10 Male & 24 Female
Mean age 26 (±4) years
BMI 23.6 (±3.3) kg/m^2

Equipment

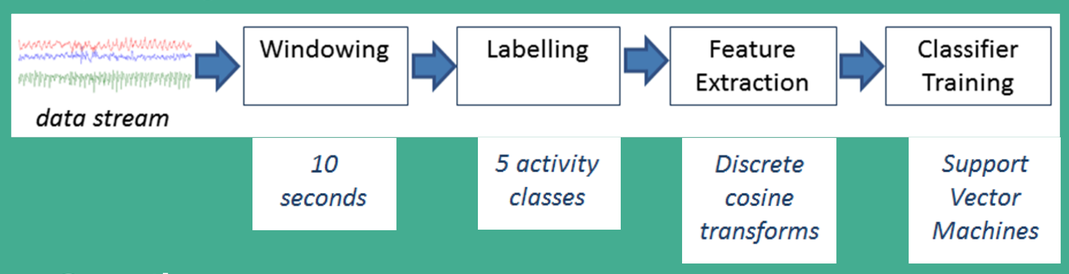
Axivity AX3 accelerometers (Axivity, UK) right wrist & anterior thigh

Methods

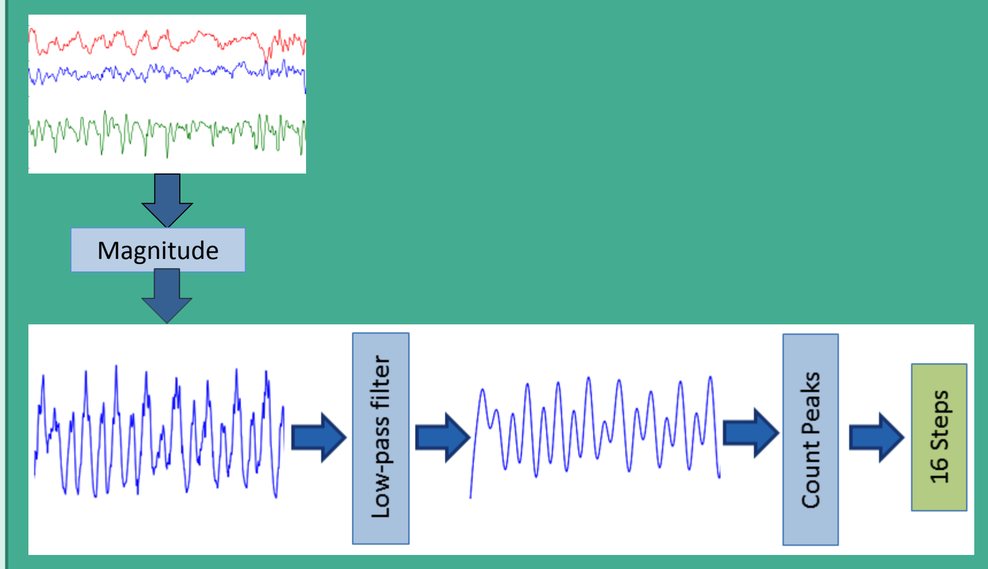
5 Physical Activity protocols (random order)
Overground walking
Sedentary activities
Standing
Stair climbing
Treadmill running



Activity Recognition



Step Counting



Results

Mean F1 Score	Thigh	Wrist
Running	0.957	0.955
Walking*	0.968	0.906
Sedentary*	0.991	0.935
Standing*	0.979	0.792
Stairs*	0.931	0.710

*p<0.01

Conclusions

Thigh & wrist both accurate for recognising running
Small differences in accuracy for walking & sedentary activities
More pronounced differences in accuracy for stairs & standing
Wrist-mounted sensor acceptable for differentiating between ambulatory & sedentary activities

Implications

Wrist-mounted physical activity monitoring compromise between accuracy & predicted adherence
Wrist-mounted physical activity monitoring has potential for long-term physical activity monitoring in SELFBACK study
Further research required on wrist-mounted physical activity monitoring of activities such as stair climbing/descending & standing

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