INTRODUCTION

• With the proliferation of wearable devices, using such devices to track and promote habitual Physical Activity (PA) becomes a popular approach nowadays[1].

• The ActiGraph wearable devices (Figure 1) which have the proprietary output “counts”, are the most frequently used devices by the researchers.

• “counts” has been widely used to develop Energy Expenditure (EE) algorithms and activity intensity thresholds for a variety of populations[2].

• These “counts”-based algorithms and threshold cannot be applied to commercially available smartwatches and smart bands which don’t have this proprietary output.

OBJECTIVES

To evaluate the “counts” that was converted following Brand et al.’s approach[4] (Figure 2) against the ActiGraph “counts” on their agreement over a wide range of PA performed by Manual Wheelchair Users (MWUs) with Spinal Cord Injury (SCI).

METHODS

Converting raw accelerometer signal to ActiGraph “counts”:

• Raw acceleration data collected at 30 Hz from 32 participants with SCI during wheelchair-related activities

• ActiGraph “count” generated using 1-second epoch

• Applied the Python script from Brand’s GitHub repository to convert the raw accelerometer signal to ActiGraph “counts”[3]

The converted “count” was evaluated against ActiGraph “count” using:

• One sample t-test

• Bland-Altman plot

• simple linear regression

• equivalence test

• Activity intensity classification using developed “counts”-based thresholds

RESULTS

Mean difference of 99.6 counts and mean percentage difference of 0.95% (both p<.001) were found between the two ‘counts’. Bland-Altman plot (Figure 3) and the simple linear regression showed no significant relationship between the difference and the mean. The equivalence test proved the two measures are statistically equivalent within 5%. In terms of classification consistency, the two ‘counts’ showed a low percentage difference ranging from 0.1% to 1.1% among three activity intensity levels (Table 1).

CONCLUSIONS

This study converted raw acceleration signals to ActiGraph ‘counts’ for a variety of wheelchair-related activities and compared it with the criterion proprietary ‘counts’. High equivalence, low classification difference, and low errors were confirmed between the two measures, indicating the feasibility for other wearable devices to adopt established thresholds, equations, and models based on ActiGraph proprietary ‘counts’.

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REFERENCES

