Comparing ActiGraph CentrePoint Insight Watch, GT9X Link, and wGT3X-BT Accelerometers to NHANES 2011-2014 GT3X+ Devices using an orbital shaker

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Introduction: With many researchers seeking to compare their accelerometry data to the NHANES dataset, it is important to establish equivalence between current ActiGraph device generations and the GT3X+. Doing so may help to characterize potential inter-generational differences in data stemming from hardware or firmware changes over time. **Methods:** ActiGraph devices (15 of each) wGT3X-BT, GT9X CentrePoint Insight Watch (CPIW), and original GT3X+ devices used in the 2011-2014 NHANES data collection were tested on a modified VWR benchtop orbital shaker between 0-250 RPM [~0-3500 milli-g (mg)] in increments of 25 RPM. All devices were tested at 80 Hz except CPIW (64 Hz). Raw vector magnitude (VM) was evaluated as the primary outcome. Equivalence was evaluated two ways: 1) using a ±50 mg threshold and 2) using a ±5% equivalence zone based on the mean GT3X+ VM at each frequency suggested by ActiGraph. Devices are considered statistically equivalent if the 90% confidence intervals fall completely within the equivalence zone. **Results:** Using either the ±50 mg (Figure 1A) or ±5% prespecified equivalence zone (Figure 1B), all devices were statistically equivalent throughout the range of accelerations except the GT9X and wGT3X-BT devices at the highest accelerations. However, the VMs of the newer devices were consistently below the GT3X+, except the CPIW at the highest accelerations (225 and 250 RPM or 3000 and 3600 mg). **Conclusion:** All ActiGraph generations were found to be statistically equivalent across a range of simulated accelerations to those observed in human studies. However, it is unknown if the consistent small disparities in raw accelerations between device generations detected by mechanical oscillator will lead to practical differences in week-long remote monitoring assessments of physical behavior.

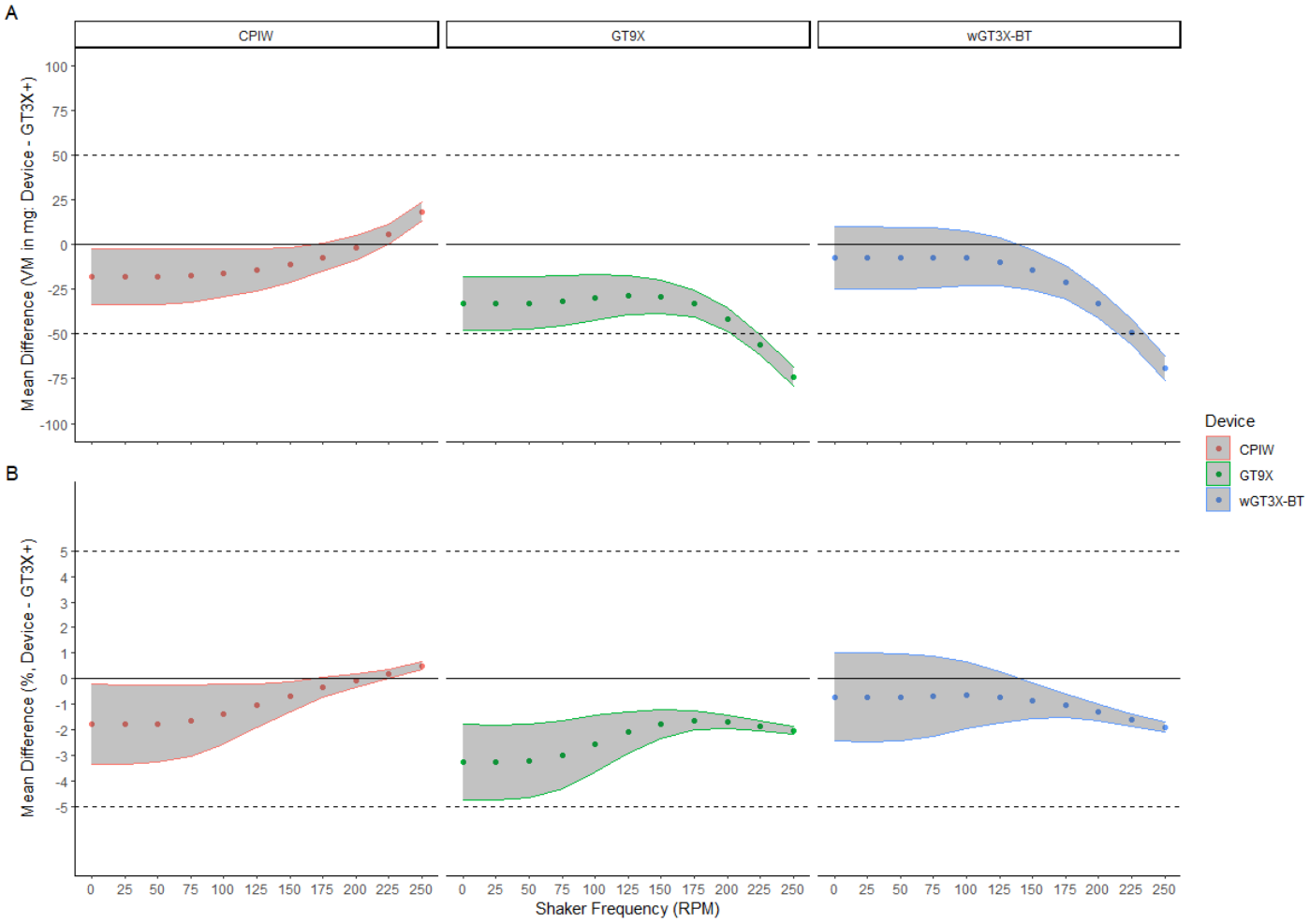

Figure 1. Mean differences in vector magnitude (in milli-g's) are shown for the CentrePoint Insight Watch (CPIW), GT9X, and wGT3X-BT compared to the GT3X+ by shaker frequency. A) 50 milli-g equivalence zones and B) 5% equivalence zones are shown are shown in the dashed lines and the shaded regions are the 90% confidence intervals for the mean differences for each device.