IPEN Adolescent Accelerometer Methods Guidelines

Below are the various issues, criteria, and definitions that need to be addressed and standardized to the extent possible to achieve comparability in accelerometer data across countries. The Cain et al. (2013, in press) article (http://sallis.ucsd.edu/Cain_Review.pdf) addresses many of these issues in more detail.

- **Accelerometer model**: any Actigraph model will be acceptable. Although there are differences between the old (7164) and new generation Actigraphs (Rothney 2008, Kozey 2010), several countries have already collected data with the 7164 devices so we’ll have to deal with this. For new countries, we recommend the GT3X+ (512MB) because of the flexibility in data processing and longer battery life. The Coordinating Center (CC) will have some to loan.

- **Low frequency filter**: The recommendation is to use the low frequency extension (LFE) with the new models (GT1M, GT3X, GT3X+). This will increase the sensitivity of the devices to detect movement, particularly on the low end of the intensity spectrum, and attenuate the differences found between old and new generation Actigraphs (Mathias 2012; Cain et al. paper under review). Although Mathias reported an LFE bias at the MVPA level, this was not found in the U.S. data. The San Diego team is planning a low frequency comparison study in teens to see if results replicate those with adults. *Note: unfortunately the LFE makes step counts unusable!*

- **Non-wear time definition**: there is not a clear recommendation yet -- one study supports a 30 minute definition (Rowlands 2009) while another recommends 90 minutes (Choi 2011). The US and Australia will be conducting “sitting” studies to determine how many consecutive 0’s are recorded during bouts of sitting in adolescents. This will help us develop a non-wear definition that is long enough to detect sedentary bouts but not so long as to misclassify non-wear as sedentary. *If data screening happens before an official recommendation is developed, please contact the CC for advice on how to proceed.*

- **Epoch length**: For data collection, we recommend countries collect data with the shortest epoch possible, after considering memory and battery limitations of the devices. However, for the pooled dataset we need to match all data to the longest epoch used in any country, which is 60 seconds. PA outcomes from different epochs have been shown not to be comparable in adolescents (Edwardson 2010). Therefore, when transferring data to the CC, we will ask that data are aggregated to 60 seconds before processing. Calibration studies have used different epochs (e.g., Freedson = 60 seconds, Treuth = 30 seconds, Evenson = 15 seconds) but it has become common practice to adjust threshold values to match the epoch. If anyone knows of validity studies on epoch-adjusted cut points, please share them.
• **Cut points**: There are a lot of options which provide very different results and it is difficult to make a recommendation at this point. One recent validation study supports Freedson age-specific (4 METs) and Evenson cut points (Trost 2011), and the 100 cpm sedentary threshold seem to be generally well supported (Ridgers 2012, Fisher 2012, Carr 2012, Trost 2011). In the US adolescent data, the relationship between MVPA and neighborhood walkability did not differ substantially between Freedson 3 METS, Freedson 4 METS, and Evenson cut points. The mean PA estimates were substantially different, but the high-low walkability differences in average minutes per day of MVPA were quite similar across the three methods. We may decide to score the data with a few different cut points, or consensus on this issue may emerge over the next few years. This seems like a good topic for discussion and input from all investigators!

• **Wear days**: The recommendation is to ask participants for 7 days of wearing, including 2 weekend days. This means that there will be 8-9 days from drop off to pick up to allow for 7 full wearing days. Participants should be instructed to wear for an extra day (or more) at the end of the week if they forget to wear or don’t wear for a full day. Regular check-ins are important here so pick-ups can be rescheduled if more wearing time is needed. Enough wear days for compliance (i.e., no rewear requested) should be 5, including 1 weekend day. This might be more than other studies require, and for inclusion in the final dataset we may have to adjust this to what is reasonable across countries. There may be statistical methods we develop to allow for inclusion of participants with just 1 or 2 days of data. This is a decision we will have to make when all the data are in and processed.

• **Daily wear hours for compliance**: The recommendation is 10 hours of wear time to be considered a valid wear day for compliance. Others have recommended reducing the required wear time on weekends (Rowlands, 2007) because typical adolescent weekend schedules may make recording 10 wearing hours difficult. In the US, there was minimal impact of using the 8- versus 10-hour weekend criteria. Wearing hours, including weekends, is worth discussing in an international context. Similar to wear days, for inclusion in the final dataset we may have to adjust to what is reasonable across countries or use a “70/80” rule within each country. This decision will have to be made when all data are in.

• **Compliance strategies**:
  - Rewears if not enough data collected the first time (make sure teens know this ahead of time; we put a statement about this in consent and assent forms)
  - Reminder calls and texts regularly during wearing week
  - Participant wear time log (we will share a sample form used in the US)
  - Incentives for completion
• **Time Filters:** Thinking ahead to ways we may want to summarize accelerometer data, recording school start and end times might be valuable information. This would allow the creation of in-school and out-of-school accelerometer measures. To reduce participant burden, school schedule information could be collected by the research team concurrent with accelerometer wearing.

**References**


