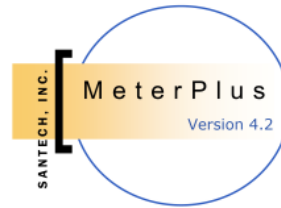


# IPEN Accelerometer Protocol

## Measuring Physical Activity for IPEN using ActiGraphs



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\*Our comprehensive accelerometer data collection, data screening and data processing manual was created over the course of 10 years and is based on the cumulative experience of our research team. We have adapted our protocols and materials for all age groups and successfully collected accelerometer data from over 5000 adults, seniors, teens, and children. This manual is designed for the IPEN study of adults in over 12 countries which will pool accelerometer data from over 8,000 participants. We have adaptations to this manual for other populations.

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# 1. Preparing for ActiGraph Data Collection

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## A. Determining Inventory Needs

To determine how many units you need, there are a few estimations that need to be made.

1. How many participants do you want to measure in what amount of time?
2. How many units will be lost in this amount of time? (see our loss rates in Appendix, page 52)
3. What will be your average return time and in-office turnaround time?

The following will affect your return time and loss rates:

- i. How will your units be delivered and retrieved?
- ii. What population are you working with?
- iii. How well staffed you are for prompting?

Some research groups have developed formulae for helping determine the number of devices needed to complete data collection efficiently. For example, Dr Jim Sallis' group recommends computing the following:

1. *# days of data collection / [return time + in-office time] = X*
2. *X \* [loss rate] = Y*
3. *X - Y = the number of time the unit can go out in data collection period used above (Z)*
4. *Number of participants to measure / Z = desired inventory to meet your measurement goals*

**FOR EXAMPLE:** Suppose we needed to measure 100 people one time across a 12 month period using a mail out and mail return protocol. Using this formula and assuming a 30-day average return time, 5 days of in-office time, and 4% loss, it would be determined that 10 ActiGraphs were needed. So we would need to have 10 ActiGraphs for every 100 participants to measure.

## B. Equipment

There are several different ActiGraph models ("ActiGraph" is also the name of the company). Below is a brief description of each. For IPEN, any of these models are acceptable. We are conducting studies to determine a correction factor to allow us to use different Actigraph models in a pooled dataset. We do not currently know the compatibility of the Actical with the Actigraph, but a study is underway to help us determine this.

## 2. Charging, Testing, Initializing, and Delivering ActiGraphs

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### A. Charging

The ActiGraph GT3X's rechargeable Lithium Ion battery is capable of providing power for 21 days without recharging (GT1M is 14 days). Recharging is automatic and is accomplished by connecting the ActiGraph to a standard USB port. Charging time will depend on the battery life, but will typically not exceed three hours for a fully depleted battery. When connected to the USB port of a computer, the LED will FLASH until data collection starts. This indicates that the ActiGraph is charging. Once the battery is completely charged, the LED light inside the device will remain lit (it will no longer flash). When the device is removed from the charging hub, the LED will go off. A fully charged battery will have just over 4.0 volts. If the battery goes below 3.1 volts, the device will not have sufficient power to initialize and download. The battery level, reported in volts, can be viewed using the ActiLife Lifestyle software. Just plug the device into a computer and the remaining voltage will appear on the default screen. A self-powered USB hub should be used to charge multiple ActiGraph units. Each hub should be connected to an electrical outlet and then each ActiGraph should be connected to each of the 7 USB ports using the USB cables provided. For most studies we use two USB hubs, enabling us to charge up to 14 devices at one time.

#### **About the USB/Charging Mode.**

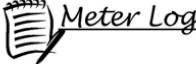
The USB/Charging mode is entered when the ActiGraph is connected to the USB port on a computer or a powered USB hub. In this mode, the battery will charge. As noted above, complete charging should happen in three hours or less. When an ActiGraph enters this mode, if the device is STILL collecting activity data, it will continue to do so; however, each epoch value will yield a null (0's in the DAT file). If the ActiGraph drivers have been installed on the computer the user will be able to communicate with the device using the ActiLife Lifestyle software.

**IMPORTANT:** If charging multiple devices using a USB hub, DO NOT connect the hub to the computer. If the hub is connected to the computer, each ActiGraph connected to the hub will attempt to communicate with the computer and may cause instability issues with the software. Therefore, the hub should be connected to a standard electrical outlet.

### 3. Compliance Tips and Prompting Procedures

#### A. Compliance Tips.

- Most helpful is the constant prompting and communication with participant (phone, email, mail, texting) and not giving up.
- Project websites - useful for demystifying the Actigraphs, can also be a place for FAQs.
- Email address and toll-free number encourages communication.
- Actigraph-generated Excel charts of valid and non-valid wearing days to increase compliance – showing these to participants before their wearing time gives them a sense of the output, encourages complete valid days. Let them know they will have to re-wear if they don't provide enough valid data
- Participant materials: Helpful to increase the amount of expected valid-wearing time on all materials (e.g., instructing participants to wear the meter for 12 hours in order to get 10), provide an “end-date” when the meter will run out of batteries or memory (this has improved our return times by 3 days on average). Including 8 days on the log resulted in 20% of sample providing 8 valid days, instead of 7 they were asked for.
- Sending stamped return envelopes, offering in-home pickup (if local)
- Meter logs (see example below) provide participants with a daily assignment that can help improve compliance. They are also helpful in analyzing meter data, as described below.



Wear the movement meter for seven (7) consecutive days.\* In the table below, write down the dates and days on which you wear the meter. Note the times, including "a.m." or "p.m.," that you put it on and take it off during each day. Also note the reason you took it off. Below is a sample entry:

Date	Feb. 26, 2005	
Day	Saturday	
	On	Off
	7:30 AM	1:00 PM
	Swimming	
	1:45 PM	10:45 PM

We have included extra spaces/rows in case you need to take off the meter during the course of the day. If you take the meter off for more than 5 minutes, such as showering, record when you take it off and put it back on.

Date														
Day														
	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off

\*If you are unable to wear the meter for seven (7) consecutive days, add additional days at the end of the week.

**FOR OFFICE USE ONLY**

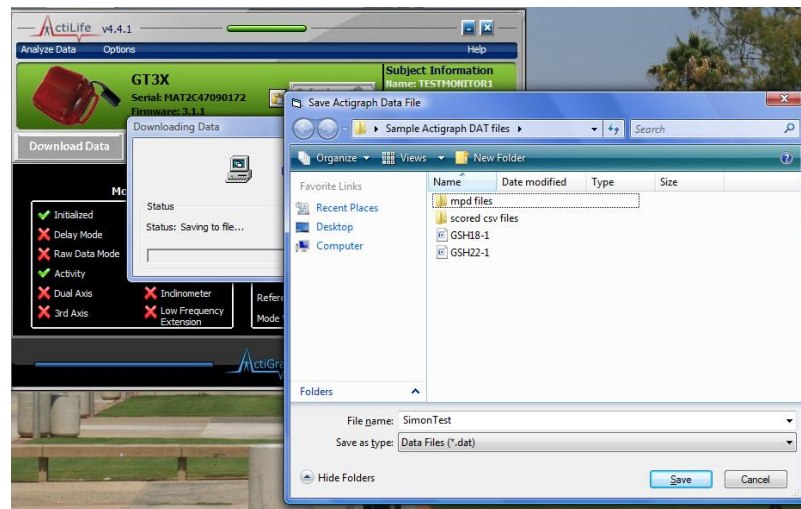
Participant ID _____	Recruiter _____	Serial Number _____	Date Initialized _____
		Valid Days _____	

**Example of meter log to be given to participants to help data decisions and improve compliance (see Appendix B for editable document).**

## 4. Receiving ActiGraph Data

### A. Downloading ActiGraph Data

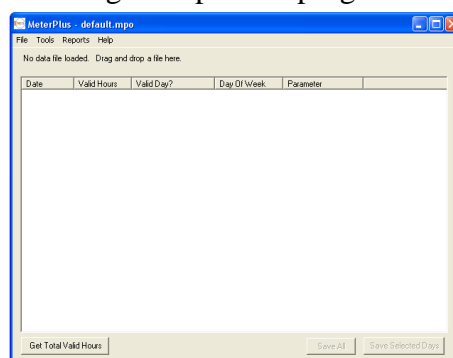
1. To download data, connect the ActiGraph to any computer that has ActiLife software loaded. As when initializing the device, the same screen will appear to indicate the device status. Click on ‘Download.’
2. After data has successfully downloaded, the following screen will display requesting you to indicate where you would like to save the data file (DAT file):



3. At this time, you may change the filename if necessary. However, if the **Study ID#** was entered correctly at initialization, this is the name that should appear in the filename box on screen and you should **NOT** change it. All DAT files should be saved in the the same folder to enable batch scoring. However, you may also want to also create copies at a later date in which each participant has their own folder.
4. Once the DAT file has been downloaded, we switch to the MeterPlus software to screen, score, and analyze the Actigraph data.

### B. Configuring Meter Plus to Screen Data

1. Click on the MeterPlus logo to open the program. The default screen will look like this:



## 5. Cleaning and Scoring Data

Before the scoring process can proceed, screened files called MeterPlus data (.mpd) files must be created from .dat files. This feature allows the user to exclude days when the Actigraph was not being worn, was in the mail, etc. and deals with non-wearing time within valid days.

### A. Configuring MeterPlus to Clean Data

Configuration Setting	Description
Hours required for a valid day	The minimum number of valid hours recorded in the raw data file for a day to make the day valid for scoring purposes.
Number of zeros in a row to make an hour invalid	The Actigraph will record a “0” count value for an epoch if there was no movement. This setting will cause MeterPlus to replace a zero count value with the “Replace strings of zeros” setting value if at least this amount of <i>consecutive</i> zero counts were recorded. This is so the correct differentiation is made between a “not wearing” value from a “sedentary, but wearing” value.
Value to use for undefined field	Data files being processed in the same folder can have varying amounts of data in them. This setting determines how to deal with the missing hours or days of data. User can select NULL or another missing data value.



## 6. Management and training

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### A. Hiring

#### Qualities to look for in Data Collectors:

When hiring data collectors, it is important to look for certain qualities that would make for an effective data collector. The obvious - look for data collectors who are reliable, trustworthy, and hard-working. Also look for data collectors who are personable, likeable, and outgoing. Remember that data collectors may be interacting with participants so it is important to have data collectors who participants feel comfortable with. A data collector who possesses these qualities and comes across as a professional would be a great addition to the team.

#### Qualities to look for in a Data Manager:

The main role of a data manager is to manage data collection efforts and to monitor that data are being collected according to protocol. Above all else, data managers should be invested in collecting quality data and must be able to pay attention to detail. Organization is important for a data manager since he/she will need to simultaneously manage all incoming, outgoing, rewear, screening, calls from participants, and questions from data collectors.

### B. Delivery and Compliance Training

As part of their training, data collectors must wear an Actigraph for several days. This allows the data collectors to speak from experience when interacting with study participants.

Provide opportunities for data collectors to role play- delivery of Actigraph and compliance, rewear requests.

Provide a checklist of talking points, but not necessarily a script

Emphasize the importance of details such as serial numbers, participant IDs, dates etc.

### C. Checking (Quality Control)

The recruitment database should be checked weekly for cases that may have fallen between the cracks. Outstanding units should also be queried periodically and reviewed to be sure that appropriate action is being taken to retrieve them.

## 7. Troubleshooting

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### Equipment:

Various problems can arise during different stages of Actigraph use. With newer models (GT1M, GT3X), most of these problems have been eliminated. The common problems we have experienced with these models relate to faulty batteries that don't hold their charge for more than a few days. This is usually identified within the first few uses of the device and can be sent back to Actigraph for repair under warranty. The Actigraph Operation Manual is sometimes helpful. For problems cannot be resolved, e-mail device support at [support@theactigraph.com](mailto:support@theactigraph.com), or e-mail the Actigraph technical representative directly: John Schneider at [john.schneider@theactigraph.com](mailto:john.schneider@theactigraph.com). Also, the website of Actigraph is <http://www.theactigraph.com/>.

### MeterPlus:

Questions about the use of data screening or scoring using MeterPlus may be answered using the MeterPlus User's Manual. You can also contact Kelli Cain at [kcain@projects.sdsu.edu](mailto:kcain@projects.sdsu.edu).

### IPEN protocol:

If you have questions about the IPEN accelerometer protocol, contact Kelli Cain at [kcain@projects.sdsu.edu](mailto:kcain@projects.sdsu.edu). If you have other questions about IPEN, contact Nicole Bracy at [nbracy@projects.sdsu.edu](mailto:nbracy@projects.sdsu.edu).

## 8. Useful Scientific references on accelerometers and PA

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## 9. Appendices

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### A. Participant Instructions for Wearing



### Instructions for Wearing the Activity Meter

This small activity meter records general movement and allows us to get a better idea of your overall activity level. It is **not** a tracking device, and we will **not** be able to tell what kind of specific activity is happening. At first, the belt may feel slightly awkward, but after a few hours, you will probably get used to it and not notice it as much. It is **extremely** important for our study that you wear the meter properly. Please follow these instructions carefully:

- ✦ Wear the meter attached to the belt around your waist, just above your **right** hipbone. You can wear it either underneath or on top of your clothing.



- ✦ Wear the meter **snug** against your body. If you have to, you can adjust the belt by pulling the end of the strap to make it tighter. Or, to loosen the belt, push more of the strap through the loop. **Wear the belt tight enough so that the meter does not move when you are being active.**
- ✦ Please **put it on first thing in the morning** -- either just after you get out of bed or just after you shower or take a bath in the morning.
- ✦ **Do not submerge the meter in water** (swimming, bathing, etc.)
- ✦ Keep the activity meter on all day (unless swimming or in the water).
- ✦ At night, **take it off right before you go to bed.**
- ✦ Do not let anyone else wear it.

There is no "ON" or "OFF" switch that you need to worry about turning on or off every day. The activity meter runs on a battery and is programmed to run continuously without you needing to turn it on. Please do not try to open the activity meter.