

*Using Accelerometers and GPS  
in Active Living Research:  
Practical Issues*

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# NIH Studies

Study	Aims	PI	Population	N	Mode of delivery	Device use
NQLS 2001-2007	Walkability & PA	Jim Sallis	Adults, 20-65	2000	Mail	Accelerometer (Actigraph 7164, 71256)
NQLS-S 2004-2009	Walkability & PA, Physical Functioning	Abby King	Seniors, 66+	900	Mail	Accelerometer (Actigraph 7164, 71256)
NIK 2005-2010	Walkability/ Rec/Food Environment & BMI, PA, Diet	Brian Saelens	Children, 5-11	800	In-person & mail	Accelerometer (Actigraph GT1M)
TEAN 2007-2011	Walkability, Rec/Food Env & PA, Diet	Jim Sallis	Teens, 12-16	850	Mail	Accelerometer (Actigraph 7164, 71256) & GPS (GlobalSat DG-100)
IPEN 2009-2013	Walkability & PA in numerous countries	Jim Sallis	Adults, 18-65	3000	In-person & mail	Accelerometer (Actigraph 7164, 71256)

# Format of workshop

## ■ Presentation

- A. Actigraph Equipment & Tracking
- B. Compliance for Wear Time
- C. Actigraph Data Screening & MeterPlus
- D. GPS Data Collection

## ■ Breakout sessions

Goals:

1. ask more in-depth questions
2. learn from others experience & approaches
3. get hands-on with the equipment, data, software, etc.

# Learning Objectives

## A. Actigraph Equipment & Tracking

1. What pieces are needed to get started
2. How to initialize Actigraphs
3. How to download data
4. Benefits of having good tracking database

## B. Compliance for Wear Time

1. Tips for describing to participant
2. Tips for in-person & mail delivery & retrieval
3. Tips to increase compliance
4. Prompting protocols

# Learning Objectives

## C. Actigraph Data Screening & MeterPlus

1. Why it's important to screen data
2. What 'valid' vs 'invalid' data look like
3. Features/benefits of using MeterPlus

## D. GPS Data Collection

1. What pieces are needed to get started
2. How to initialize the DG-100
3. How to download data
4. What descriptions & instructions are helpful for teens

# Quality Control & Data Management

- Important to devote time & effort to quality control & data management
- An investment to get better measurements
- One devoted staff person, half-time job

# Actigraphs: Equipment & Tracking

Erin Merz



7164



GT1M

# Equipment

## ■ Actigraphs

- Label with contact info & serial number
- Label to show participants which side goes up
- Inventory in a database
- Price about \$300 each
- Not waterproof
- Data collection speed controlled by # devices
  - Ongoing: 1 for every 10 participants to measure in a year



## ■ Belts, clips

- Where to purchase material
  - Information in handout
- Different size belts
- Loss rate higher for clips
- Worn under or over clothing

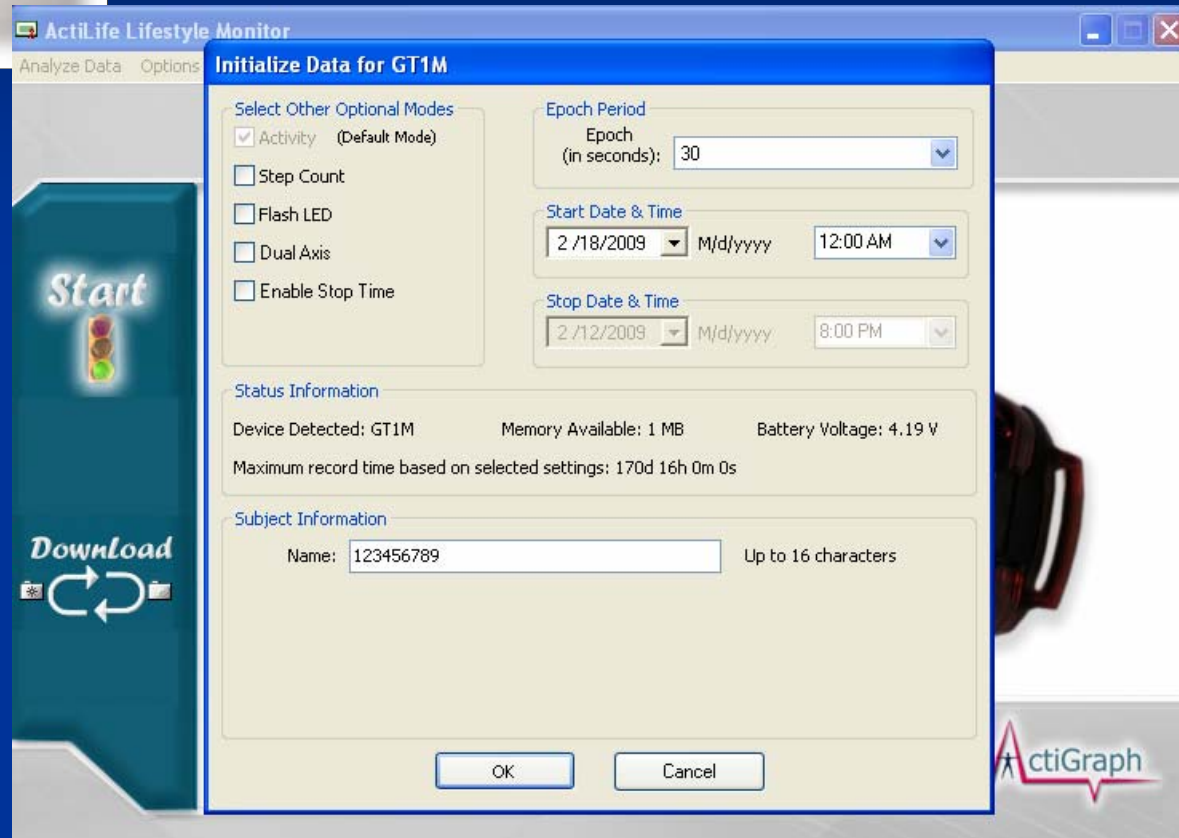
## ■ Calibrator for older models





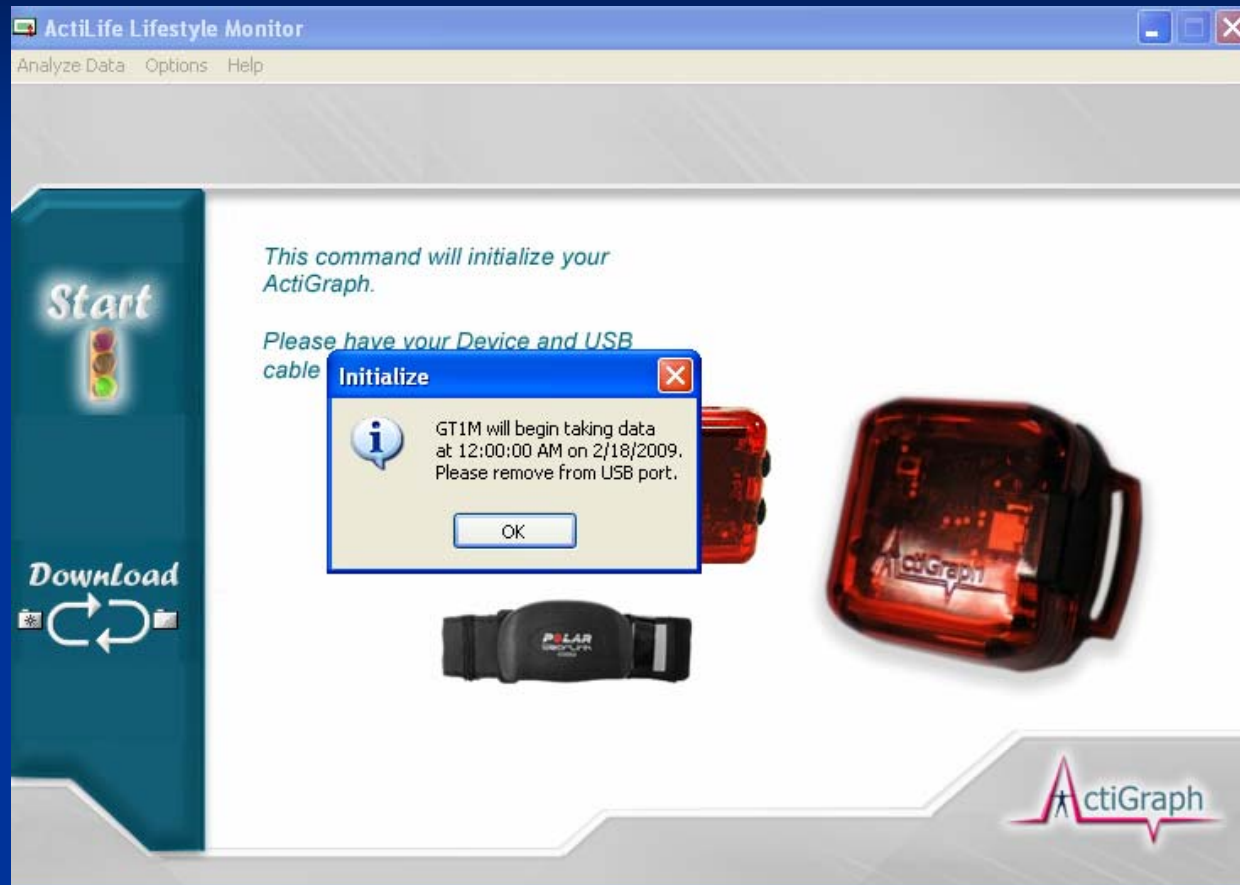
# Initializing

## ■ Actilife software



- 2 week battery life so initialize when participant is ready to wear
- Standardize start time to make processing easier – 12am is ideal

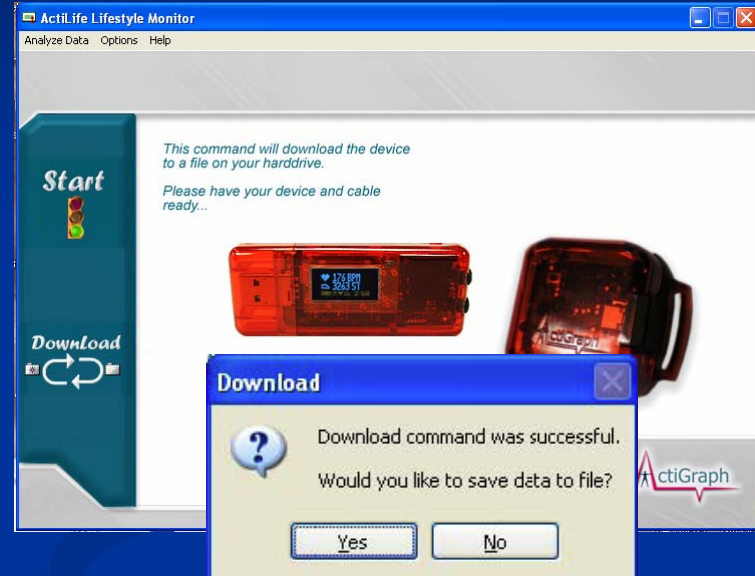
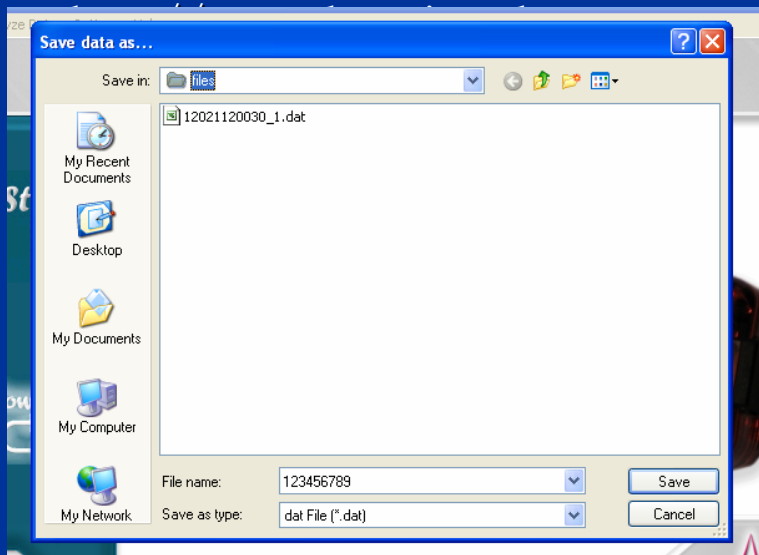
# Initializing



- Flashing light in “1” sequence is delay mode before actively collecting data. Once collecting data, will not flash.

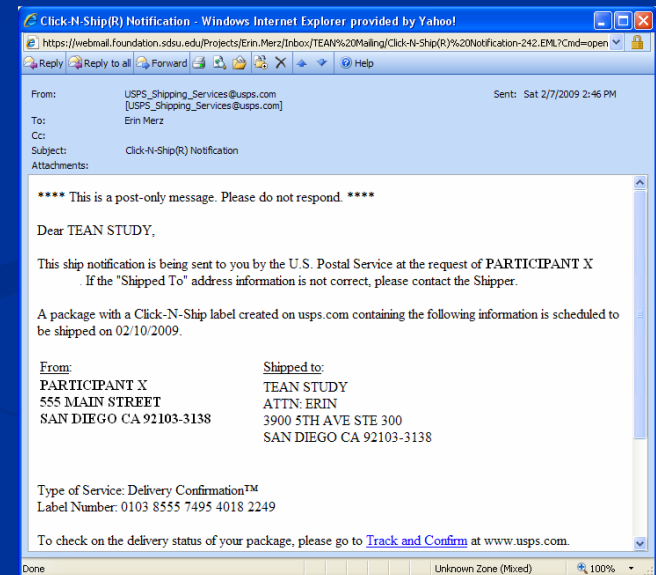
# Downloading

- Save data as .dat file
- File naming
- Errors



# Mailing

- Online USPS (click-n-ship)
- Priority Mail (<http://www.usps.com/shipping/prioritymail.htm>)
- Tracking both ways with email confirmation
- Costs:
  - Postage: \$4.80 each way
  - Padded envelope: \$.70 each
  - Flat Rate envelope: free
  - Labels: \$.20
  - Budget for increasing postage rates



# Tracking

- Access database
- Each wearing is a record
- Track by serial number and participant
- Queries
  - Length of time out
  - Problem units
  - Compliance rates
  - Outstanding units

# Access Database

The screenshot displays the Microsoft Access interface. The main window is titled "Microsoft Access" and shows a menu bar (File, Edit, View, Insert, Format, Records, Tools, Window, Help, Adobe PDF) and a toolbar. The font is set to MS Sans Serif, size 8. A search box on the right says "Type a question for help".

In the background, a window titled "Meter Database : Database (Access 2000 file format)" is open. It shows a navigation pane on the left with categories: Objects, Tables, Queries (selected), Forms, Reports, Pages, Macros, Modules, Groups, and Favorites. The main area of this window lists several queries: qryLengthTimeOutSENIOR, qryLengthTimeOutSENIOR Seattle2ndpart, and QryLostMeters.

In the foreground, a form titled "frm meters" is displayed. It contains the following fields and values:

Participant #	10410380.0	Date Received	2/28/2003
Serial #	50310	Date DnLoaded	2/28/2003
Date Sent	1/29/2003	Date Verified	2/28/2003
Date Activated	2/1/2003	Valid Days 10hr	9
Battery Hours	1110	Valid Days 8hr	
Recruiter #	12	Valid Hours	
Stage	1	Lost meters	
Round #	4	Comments	
City	1		
Neighborhood	4		
Recruiter Site	1		
Senior Study	0	Sent for repairs	<input type="checkbox"/>

At the bottom of the form, it says "Record: 1 of 5841".

# Compliance for Wear Time

Carrie Franklin

# Rates

Study	Valid Wearing Time Guidelines	Compliance Always ask for 7 days	Return Time (median)	Equipment Loss Rate
Seniors	5 valid days, <45 minutes of consecutive “0” counts per hour	90%	20 days	0.7%
Adults	5 valid days, <30 minutes	88%	20 days	2.6%
Teens	5 valid days (1 weekend), <30 minutes	76%	23 days	2.4%
Children	6 valid days (1 weekend), <20 minutes	74%	21 days	1.6%

- Valid day = 10 valid hours
- We always ask for 7 days. Most people wear it the suggested number of days, just not for enough time per day

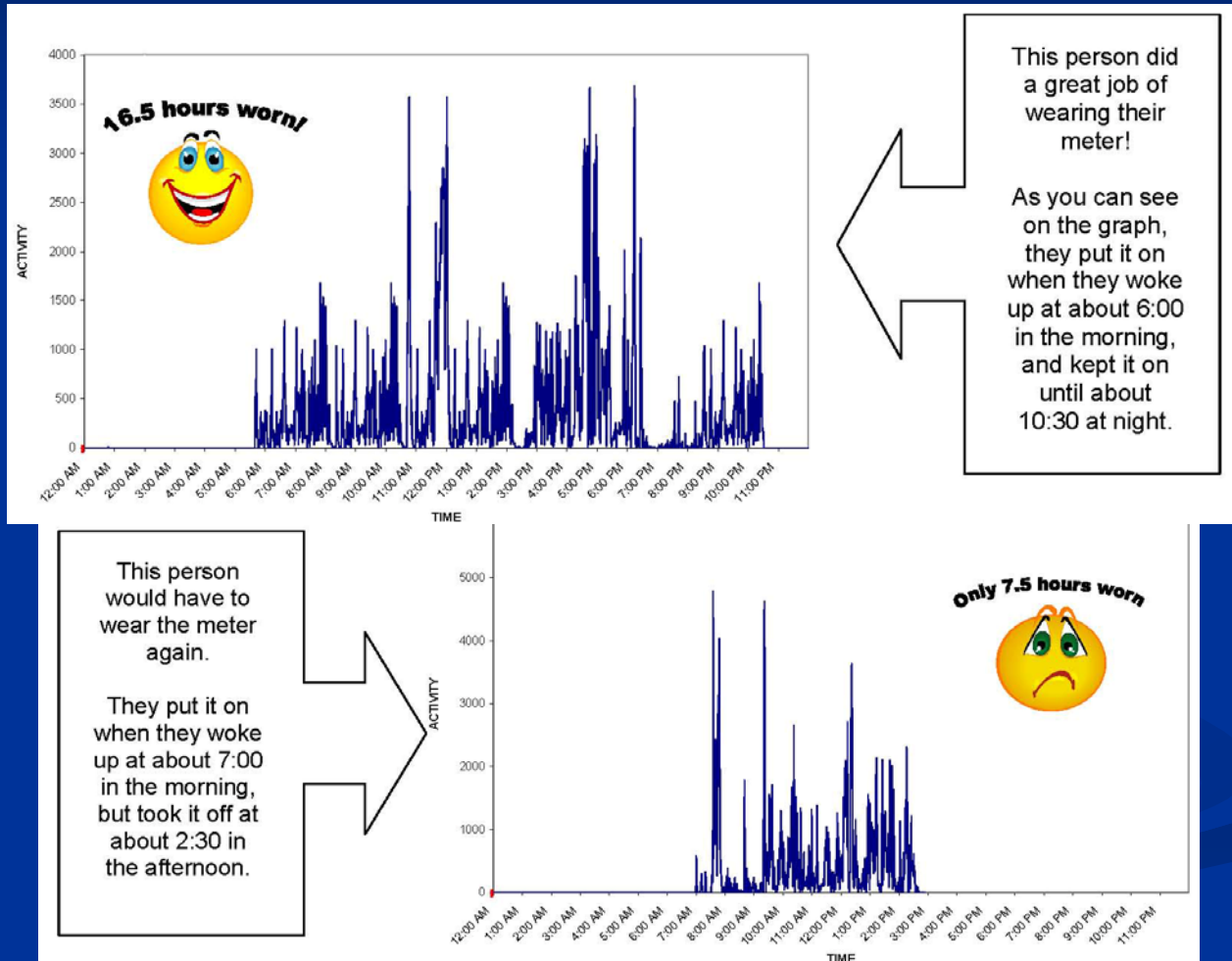


# Description for participant

- Like pedometer
- Runs on battery
- Measures movement, not what you're doing or where you are
- Recruiter's personal experience
- Project website
- Incentives
  - \$10 per measure (e.g., meter and survey = \$20)

# In person delivery & retrieval

- Include parent & child
- Show how to wear and talk about when to wear
- Special privilege
- Valuable
- Stress how long to wear (see charts)
- Will ask to re-wear
- Provide envelope for return
- Home pick-up



# Mail Delivery & Retrieval

- How to wear meter
- Increase valid wearing time expectations (i.e., ask for 12 hours)
- Providing an end date improved return time by 3 days
- Toll-free number and email address



## How to Wear the Activity Meter

This small activity meter records general movement and allows us to get a better idea of your overall activity level. 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. If it is not worn properly, we may have to send it back for you to wear again. 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 so that the star sticker is facing **up**.



- ⊗ 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**. You should be wearing the meter for **at least 12 hours** each day.
- ⊗ Do not let anyone else wear it.
  
- ⊗ **The meter has a very short battery life.**
- ⊗ **The last full day that it will work is \_\_\_\_\_.** If you cannot begin wearing it by \_\_\_\_\_, please call **1-877-440-4832** as soon as possible!

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.

# Log/Journal



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. Below is a sample entry:

<b>Date</b>	Feb. 23, 2005	
<b>Day</b>	Wednesday	
	<b>On</b>	<b>Off</b>
	7:30 a.m.	11:00 a.m.
	11:15 a.m.	10:45 p.m.

We have included extra spaces/rows in case you need to take the meter off 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.

<b>FOR OFFICE USE ONLY</b>		Serial Number _____
Participant ID _____	Recruiter _____	Date Initialized _____
		Valid days _____

# Prompting Material Return

## Phone calls

- First calls: to remind of criteria, proper wearing
- Prompt calls weekly

## Emails

- Use in combination with phone calls, most effective with adults and teens

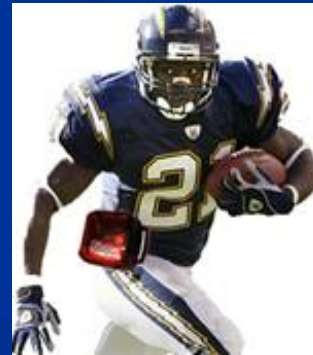
## Mailings

- Last resort: if phone calls are not successful, begin mailing return materials, reward letter

# Materials



- Stickers for young kids
- Instruction sheets
- Logs/Journals
- Charts



Questions?

# Actigraph Data Screening & MeterPlus

Kelli Cain



# Data screening

- Screen data right away
  - Re-wears
  - Compliance only 75% in children & teens. Would lose opportunity for good data in 25% without screening protocol in place
- Looking for valid wear time & device malfunction
- Custom software (MeterPlus) makes this easy

# Examples of data

- *Wear time*
- *Mail days*
- *Malfunction/Invalid data*

# Wear time – typical pattern

Daily Info for Thursday, August 22, 2002

Number of Data Points each Hour: 60

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
198	164	344	148	311	108	207	76	14	86	25	68	127	260	95	
20	37	77	211	12	24	0	10	0	4	11	0	0	0	0	0
6	4	0	5	0	0	8	8	2	0	0	0	0	0	0	0
87	2	0	195	315	0	11	15	20	19	13	71	49	4	6	
5	0	253	1131	951	182	251	6	1480	831	90	11	0	162	269	
83	0	280	76	86	194	138	28	150	426	12	513	173	246	39	
202	15	195	132	223	382	196	45	101	782	1239	757	1213	3832	704	
0	0	0	0	0	0	0	12	423	469	1133	488	392	197	816	
894	1063	900	386	760	208	537	90	160	265	1079	558	1332	1090	862	
469	873	1338	1963	2133	1079	684	1093	1347	2070	662	334	531	846	1231	
768	159	385	1634	1898	2009	539	2076	2167	2225	310	321	3136	2675	616	
525	772	639	132	149	125	33	49	99	98	490	638	261	126	34	
544	1022	319	239	310	0	15	0	1	26	83	38	0	43	7	
0	0	1	4	0	0	0	0	0	0	127	0	0	0	9	
0	0	28	2	0	0	1	104	0	0	0	0	0	6	0	
0	0	0	0	0	0	236	314	894	584	342	35	419	291	159	

Change Valid Value     Valid     Invalid





MeterPlus

Version 4.0

# MeterPlus

- User-friendly & flexible
- Anyone can use it
- Program settings appropriate for your study
- Will batch-process your files

# The birth of MeterPlus

Before

Visual screen for consecutive zeros

A97				144	251	337	165	153	310	45	6	50	187	29	21	131	57	125	68	163	20
88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
97	144	251	337	165	153	310	45	6	50	187	29	21	131	57	125	68	163	207	304	819	348
98	61	115	0	7	466	626	2074	468	195	491	363	112	287	554	10	1038	196	466	496	170	2011
99	462	357	247	220	15	88	104	105	31	88	15	89	129	141	273	561	37	35	3	65	59
100	900	2529	3790	3905	3094	3003	3158	2619	436	992	357	306	270	25	9	3	1	1	227	64	286
101	144	2	15	27	20	2	0	22	315	2123	2326	2293	2221	2107	1645	3123	3966	251	2933	2231	21
102	776	284	71	1290	1794	1466	1681	1197	1563	1892	1233	1725	1823	1699	1936	1968	1433	1601	1681	26	0
103	505	257	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
104	0	47	0	0	0	0	0	0	6	0	0	0	4	0	266	282	0	2	0	9	2
105	0	1	0	4	0	0	10	22	39	41	0	4	52	0	42	0	41	0	19	4	20
106	0	0	5	0	4	521	696	0	0	0	0	0	0	0	1017	675	2	0	0	0	0
107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

After

Automated screen for consecutive zeros

Date	Valid Hours	Valid Day?
8/15/2002	2	No
8/16/2002	0	No
8/17/2002	0	No
8/18/2002	8	No
8/19/2002	11	Yes
8/20/2002	12	Yes
8/21/2002	13	Yes
8/22/2002	14	Yes
8/23/2002	11	Yes
8/24/2002	0	No
8/25/2002	7	No
8/26/2002	1	No
8/27/2002	4	No
8/28/2002	0	No

Copy & paste data for each file

- Serial Number: SM51166
- Start Time: 00:01:00
- Start Date: 11/11/2005
- Cycle Period (hh:mm:ss): 00:01:00
- Download Time: 10:18:30
- Download Date: 12/12/2005
- Current Memory Address: 45260
- Battery Life Remaining: 1076 hrs
- Both the Freedson and Work Energy were used to estimate kcals
- A body mass of 59kg was used to estimate kcals
- Daily Activity Summary

Date	light1	moderate2heavy3	very heavy	Counts	Steps	KCALS	
11/11/2005	1438	1	0	0	5897	N/A	6.84
11/12/2005	1440	0	0	0	0	N/A	0
11/13/2005	1440	0	0	0	0	N/A	0
11/14/2005	1440	0	0	0	0	N/A	0
11/15/2005	1440	0	0	0	1874	N/A	2.11
11/16/2005	1440	0	0	0	0	N/A	0
11/17/2005	1440	0	0	0	0	N/A	0
11/18/2005	1440	0	0	0	0	N/A	0
11/19/2005	1440	0	0	0	0	N/A	0

- Serial Number: SM51166
- Start Time: 00:01:00
- Start Date: 11/11/2005
- Cycle Period (hh:mm:ss): 00:01:00
- Download Time: 10:18:30
- Download Date: 12/12/2005
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11/12/2005	1440	0	0	0	0	N/A	0
11/13/2005	1440	0	0	0	0	N/A	0
11/14/2005	1440	0	0	0	0	N/A	0
11/15/2005	1440	0	0	0	1874	N/A	2.11
11/16/2005	1440	0	0	0	0	N/A	0
11/17/2005	1440	0	0	0	0	N/A	0
11/18/2005	1440	0	0	0	0	N/A	0
11/19/2005	1440	0	0	0	0	N/A	0

Date	light1	moderate2heavy3	very heavy	Counts	Steps	KCALS	
11/11/2005	1438	1	0	0	5897	N/A	6.84
11/12/2005	1440	0	0	0	0	N/A	0
11/13/2005	1440	0	0	0	0	N/A	0
11/14/2005	1440	0	0	0	0	N/A	0
11/15/2005	1440	0	0	0	1874	N/A	2.11
11/16/2005	1440	0	0	0	0	N/A	0
11/17/2005	1440	0	0	0	0	N/A	0
11/18/2005	1440	0	0	0	0	N/A	0
11/19/2005	1440	0	0	0	0	N/A	0

Batch score

Select the folder that you would like to scan to create scoring file:

C:\Users\Kelli\Documents\MeterPlus 4

Enter the name of the file that you would like to save your scoring file as:

C:\Users\Kelli\Documents\MeterPlus 4\DefaultScoring.sco

Age Settings... Create Cancel

# Steps

Screen

Screen .dat files for enough valid wear time.

Clean

Eliminate non-wearing time by creating .mpd files from .dat files.

Score

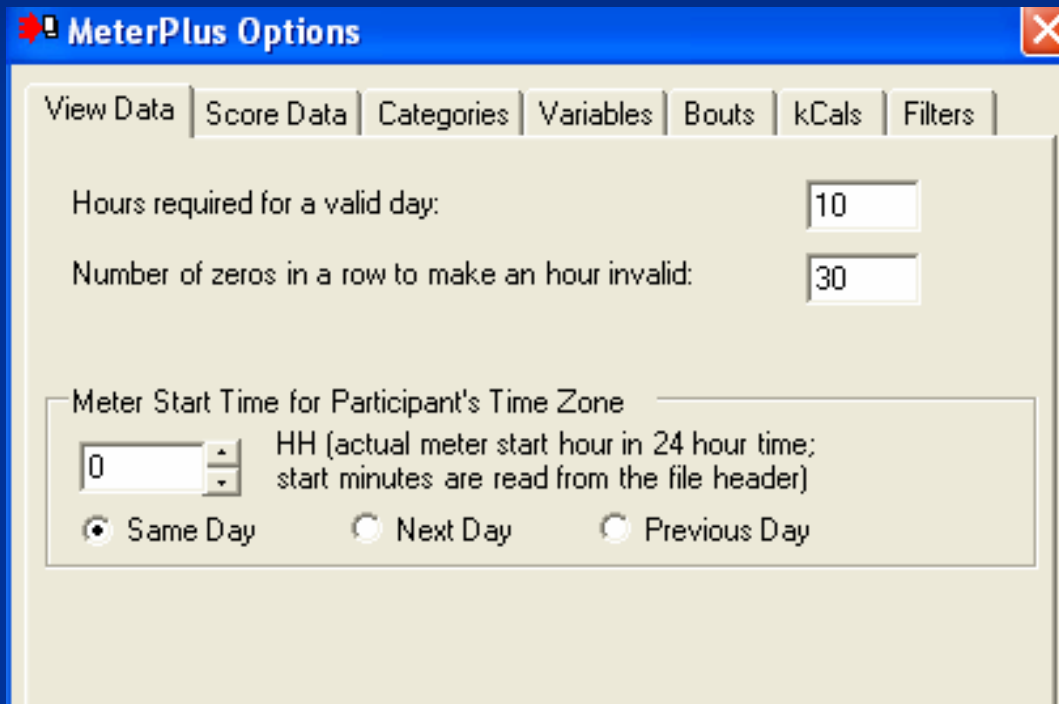
Score .mpd files to create a comma-delimited file containing activity intensity, bouts, energy expenditure & time-filtered activity variables. Can be done in a batch.

Analyze

Import the comma delimited file into statistical software and analyze.



# Settings for screening



**MeterPlus Options**

View Data | Score Data | Categories | Variables | Bouts | kCals | Filters

Hours required for a valid day:

Number of zeros in a row to make an hour invalid:

Meter Start Time for Participant's Time Zone

HH (actual meter start hour in 24 hour time;  
start minutes are read from the file header)

Same Day     Next Day     Previous Day

# Screening files

## List View

Date	Valid Hours	Valid Day?
8/15/2002	2	No
8/16/2002	0	No
8/17/2002	0	No
8/18/2002	8	No
8/19/2002	11	Yes
8/20/2002	12	Yes
8/21/2002	13	Yes
8/22/2002	14	Yes
8/23/2002	11	Yes
8/24/2002	0	No
8/25/2002	7	No
8/26/2002	1	No
8/27/2002	4	No
8/28/2002	0	No

## Detailed View



# Settings for cleaning data

**MeterPlus Options**

View Data | Score Data | Categories | Variables | Bouts | kCals | Filters

Hours required for a valid day:

Number of zeros in a row to make an hour invalid:

Value to use for undefined field:

Replace strings of zeros with the following value:

*(Zeros will only be replaced if there is a string that meets the criteria set above to make an hour invalid.)*

Output:

Directory to:  ...

Save Cancel

**Browse For Folder**

Please choose the directory where you want to save your MeterPlus Data (.mpd) files.

- My Music
- My Pictures
- My Received Files
- scans
- Updater
- Updater5
- My Computer
- My Network Places
- Recycle Bin

# Saving wear time to .mpd file

MeterPlus - default.mpo

File Tools Reports Help

C:\Documents and Settings\kcaain.ALK\Desktop\ALK workshop\123456789.DAT

Date	Valid Hours	Valid Day?
8/15/2002	11	Yes
8/16/2002	0	No
8/17/2002	0	No
8/18/2002	12	Yes
8/19/2002	17	Yes
8/20/2002	13	Yes
8/21/2002	15	Yes
8/22/2002	17	Yes
8/23/2002	12	Yes
8/24/2002	2	No
8/25/2002	10	Yes
8/26/2002	6	No
8/27/2002	10	Yes
8/28/2002	5	No

Get Total Hours Save All Save Selected Days

MeterPlus

7 days were successfully saved to  
C:\Documents and Settings\kcaain.ALK\Desktop\ALK workshop\New Folder\123456789.mpd

OK

Back Forward Search Folders

Address C:\Documents and Settings\kcaain.ALK\Desktop\ALK workshop\New Fo

File and Folder Tasks

- Make a new folder
- Publish this folder to the Web
- Share this folder

101107310.mpd  
123456789.mpd  
533100210.mpd  
6154100120.mpd

# Cut-points

**MeterPlus Options**

View Data | Score Data | **Categories** | Variables | Bouts | kCals | Filters

Group/Category Name	Min Value	Max Value
+ NIK (age 6 to 11)		
+ TEAN (age 12 to 16)		
- Adult (age 18 to 64)		
...not_wearing	-999	-999
...sedentary	0	100
...light	101	1952
...moderate	1953	5724
...hard	5725	9498
...very_hard	9499	100000
+ Senior (age 65 to 100)		

Add Group | Add Category | Edit | Delete

## Create Groups

**Edit Category Form**

Name:

Age from  to

OK | Cancel

## Add/Edit Cut-points

**CutPointForm**

Name:

Meter values from  to

OK | Cancel

# Filename

**MeterPlus Options**

View Data | Score Data | Categories | **Variables** | Bouts | kCals | Filters

Parse data file name into variables

Begin parsing for variables after the last  character.

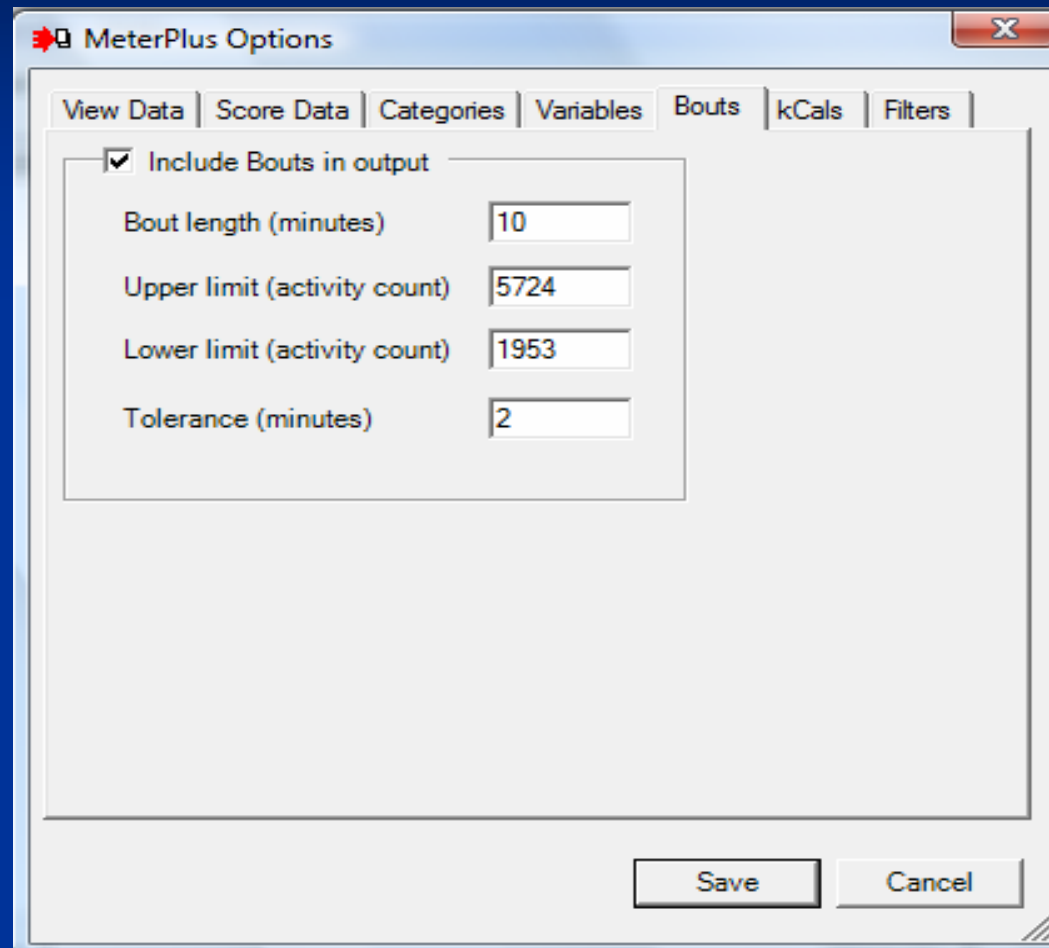
Map source data file name to:

Sample file name:

Variables:

Variable	Character Position
City	0-1
Neighborhood	1-3
Walkability	3-4
Group	4-5
ID	5-9

# Bouts



The image shows a screenshot of the "MeterPlus Options" dialog box, specifically the "Bouts" tab. The dialog box has a title bar with a red close button. Below the title bar is a tabbed interface with the following tabs: "View Data", "Score Data", "Categories", "Variables", "Bouts", "kCals", and "Filters". The "Bouts" tab is currently selected. Inside the dialog, there is a checked checkbox labeled "Include Bouts in output". Below this checkbox is a group box containing four input fields:

Bout length (minutes)	10
Upper limit (activity count)	5724
Lower limit (activity count)	1953
Tolerance (minutes)	2

At the bottom of the dialog box, there are two buttons: "Save" and "Cancel".



# Energy expenditure

**MeterPlus Options**

View Data | Score Data | Categories | Variables | Bouts | **kCals** | Filters

Include KCals/Day in output

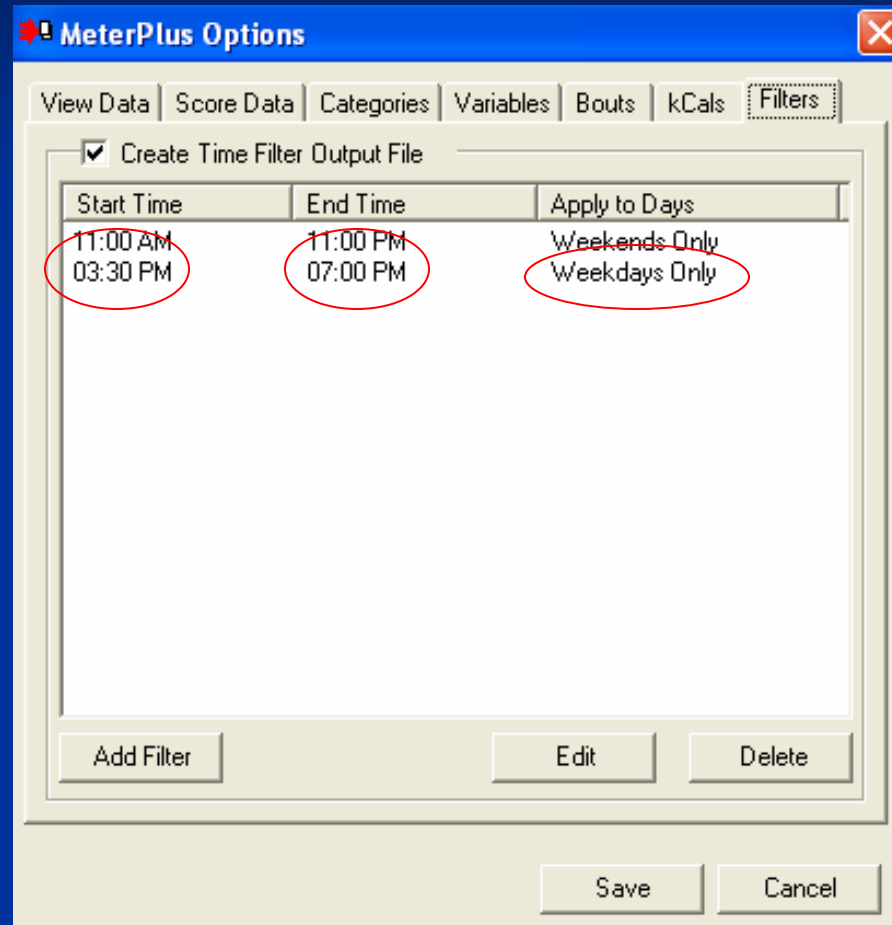
Work Energy Theorem  
 *$k\text{cals}/\text{min} = 0.0000191 * \text{counts}/\text{minute} * \text{body mass in kg}$*

Freedson Equation  
 *$k\text{cals}/\text{min} = 0.00094 * \text{counts}/\text{minutes} + 0.1346 * \text{body mass in kg} - 7.37418$*

Combination  
*Use WET for counts less than 1952 and FE for counts greater than 1952*

Save Cancel

# Time filters



# Scoring

## Age & weight

**Participant Age Data for Scoring**

Participant Age Data

Age file for participants:  ...  
*Leave blank if you don't have an age file.*

If a participant's age is unknown, use the following category group or specify an age:

Category Group:   
Adult (age 18 to 64)  
NIK (age 6 to 11)  
TEAN (age 12 to 16)  
Senior (age 65 to 100)

Don't ask again, use for all data files

Participant Weight Data

You have specified to include Kcals in the output so you need to provide the participant's weight for scoring.

Weight file for participants:  ...  
*Leave blank if you don't have a weight file.*

If a participant's weight is unknown, use the following weight:

Weight:   (in Kg)

OK

## Sample age file

test age.txt - Notepad

```
File Edit Format View Help
1020013007_1.dat,6
1197024007_1.dat,10
324015053008_1.dat,15
```

## Batch score

**Scoring Folders**

Select the folder that you would like to scan to create scoring file:

...

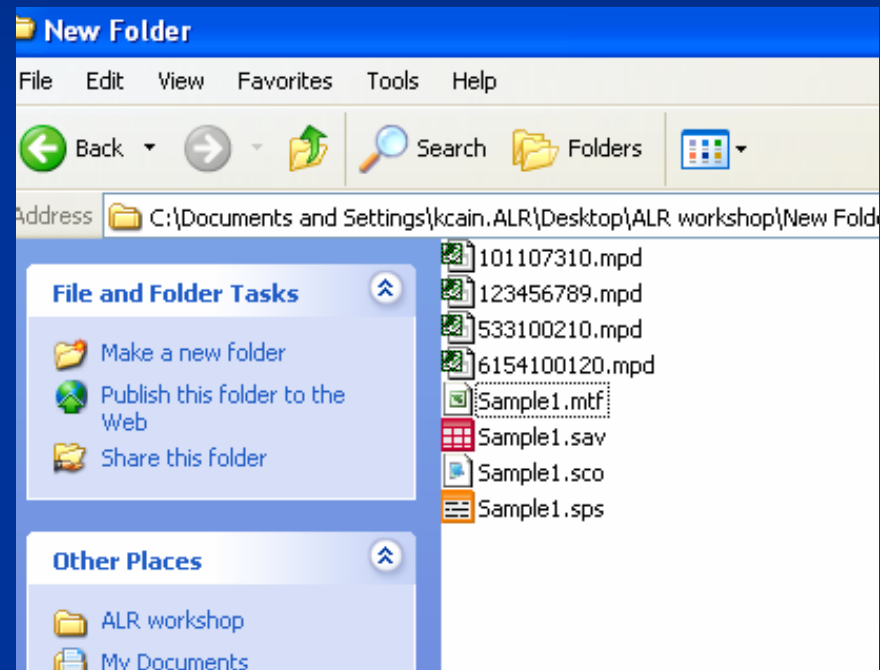
Enter the name of the file that you would like to save your scoring file as:

...

Age Settings... Create Cancel

# Output

- .mtf = time filter variables in comma-delimited file
- .sco = activity, bouts & kcals in comma-delimited file
- .sps = SPSS import syntax
- .sav = SPSS file



# Time Filter variables

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Filename	1Day	1Date	D1T1_st.t	D1T1_end	D1T1_epo	D1T1_not	D1T1_sed	D1T1_ligh	D1T1_mor	D1T1_har	D1T1_very	D1T2_st.t	D1T2_end	D1T2_epo	D1T2_not
2	101107310	Wednesday	11-12-200	07:00 AM	11:00 PM	960	301	609	45	6	NULL	NULL	NULL	NULL	NULL	NULL
3	533100210	Thursday	11-24-200	07:00 AM	11:00 PM	960	120	722	118	1	NULL	NULL	NULL	NULL	NULL	NULL
4	615410012	Tuesday	01-22-200	07:00 AM	11:00 PM	960	361	427	167	6	NULL	NULL	NULL	NULL	NULL	NULL
5																
6																
7																
8																

Activity counts falling within each activity category during each time period defined in the settings, for each day of data.

E.g., *D1T1\_moderate* = 6 epochs of moderate activity occurring during 7am & 11pm on day 1

# Activity, Bouts, EE variables

## Activity

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SN	city	neighbo	walka	group	id	Filename	Date	TotDays	VldDays	VldHours	TotVdnot_wearin	TotVdsedent	TotVdligh	TotVdmod
2	50168	1	1	1	0	7310	101107310.DAT	11/12/2003	8	8	102	5434	3585	2404	93
3	51165	5	33	1	0	0210	533100210.dat	11/24/2005	8	8	97	5915	4510	1087	8
4	50293	6	15	4	0	0120	6154100120.dat	1/22/2008	7	7	89	4808	3438	1720	114
5															

Serial number, start date, # valid days & hours, number of epochs in each activity category across all valid days.

## Bouts

	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ
1	D1_bout_num	D1_bout_len	D1_bout_avg	D1B1_st_time	D1B1_end_time	D1B2_st_time	D1B2_end_time	D1B3_st_time	D1B3_end_time	D1B4_st_time
2	1	14	14	11/12/2003 13:47	11/12/2003 14:01	NULL	NULL	NULL	NULL	NULL
3	1	10	10	11/24/2005 9:00	11/24/2005 9:10	NULL	NULL	NULL	NULL	NULL
4	4	119	29.75	1/22/2008 0:00	1/22/2008 0:17	1/22/2008 6:59	1/22/2008 8:07	1/22/2008 8:32	1/22/2008 8:55	1/22/2008 9:53
5										
6										

Number of bouts, total and average length of bouts, start and end times of each bout.

## Energy Expenditure

	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT
1	Tot_kcal	KCal_mean	KCal_peak	KCal_not_w	KCal_sedentary	KCal_light	KCal_moderate	KCal_hard	KCal_very_hard	D1Date	D1Day	D1vday	D1vh
2	1195.47	149.43	224.58	0	49.81	1145.66	0	0	0	11/12/2003	Wednesday	1	8
3	463.31	57.91	95.95	0	31.55	431.76	0	0	0	11/24/2005	Thursday	1	14
4	863.27	123.32	167.77	0	33.68	829.59	0	0	0	1/22/2008	Tuesday	1	8
5													

Total, mean & peak caloric expenditure, caloric expenditure in each activity category.

# MeterPlus

- Where to get more information  
[www.meterplussoftware.com](http://www.meterplussoftware.com)
- Demonstration at breakout session
- Brochures & sign-up sheets for more information

Questions?



# GPS Data Collection

Jill Dumbauld

# Why using GPS

- Replaced travel diary
  - Save staff time to process
  - More accurate than recall
- Routes taken
- Commuting
- Merge with accelerometer data

# GlobalSat® DG-100 Data logger

- Little user interface (disable slide switch)
  - Long battery life (about 20 hours)
  - Good Sensitivity
  - Windows utility
  - Economical (\$65)
- 
- More Bulky
  - Slower charge



# Recruitment Strategies



- Not real-time data
- Convenient, can carry
- Positive feedback from past participants
- Use of maps as incentives

# Preparing Units for Use

- Stickers and Labels
- Send “connected”



# Configuring the Units

- Delete previous data
- Configure

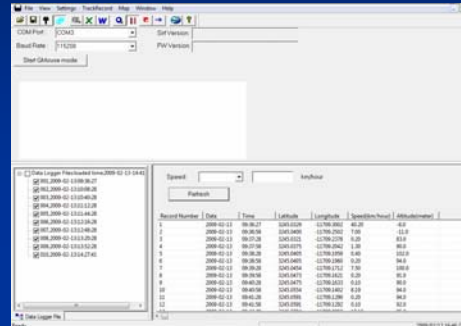
The screenshot shows the 'Device Configuration' dialog box with the following settings:

- Data logging format:**  Position, Time, Date, Speed, Altitude
- Enable WAAS/EGNOS/MSAS
- Disable data logging if speed falls below a threshold: 0 km/hour
- Disable data logging if distance is less than the selected radius: 0 meters
- Data logging interval Mode A:**  By time: 30 seconds
- Data logging interval Mode B:**  By time: 30 seconds
- Data logging interval Mode C:**  By time: 30 seconds
- System Information:** Memory Usage: 0%

Buttons: OK, Cancel

# Downloading Data

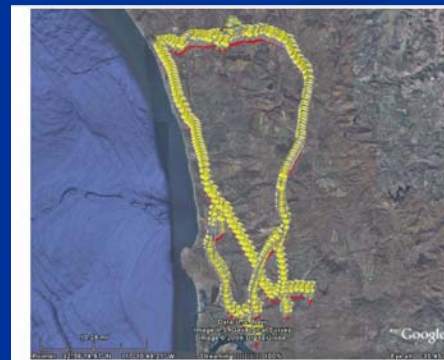
- Download
- Save / export to 4 formats
- Double-check configuration



GSD

Record No	Date	Time	Latitude	Longitude	Speed (km/hour)	Altitude (meter)
1	1/8/2009	3:35:03	3935.071	-7639.26	0.3	179
2	1/8/2009	3:35:34	3935.073	-7639.27	1.5	168
3	1/8/2009	3:36:15	3935.081	-7639.29	1.8	168
4	1/8/2009	3:36:45	3935.09	-7639.29	2.7	151
5	1/8/2009	3:37:15	3935.095	-7639.3	10.4	141
6	1/8/2009	3:37:46	3935.225	-7639.31	55.8	133
7	1/8/2009	3:38:10	3935.387	-7639.42	59.3	212
8	1/8/2009	3:38:46	3935.348	-7639.79	21.1	212
9	1/8/2009	3:39:16	3935.633	-7639.78	83.7	207
10	1/8/2009	3:39:46	3935.919	-7639.63	39.76	193
11	1/8/2009	3:40:16	3935.956	-7639.62	7.1	196
12	1/8/2009	3:40:46	3936.029	-7639.6	5.3	185
13	1/8/2009	3:41:16	3935.835	-7639.69	71.8	174
14	1/8/2009	3:41:46	3935.555	-7639.81	62.3	190
15	1/8/2009	3:42:16	3935.434	-7639.83	36.4	195
16	1/8/2009	3:42:46	3935.468	-7640.18	68.8	200
17	1/8/2009	3:43:16	3935.518	-7640.46	27.9	184
18	1/8/2009	3:43:46	3935.225	-7640.56	67.8	165
19	1/8/2009	3:44:16	3934.863	-7640.69	88.7	155
20	1/8/2009	3:44:46	3934.507	-7640.52	93.1	141

CSV



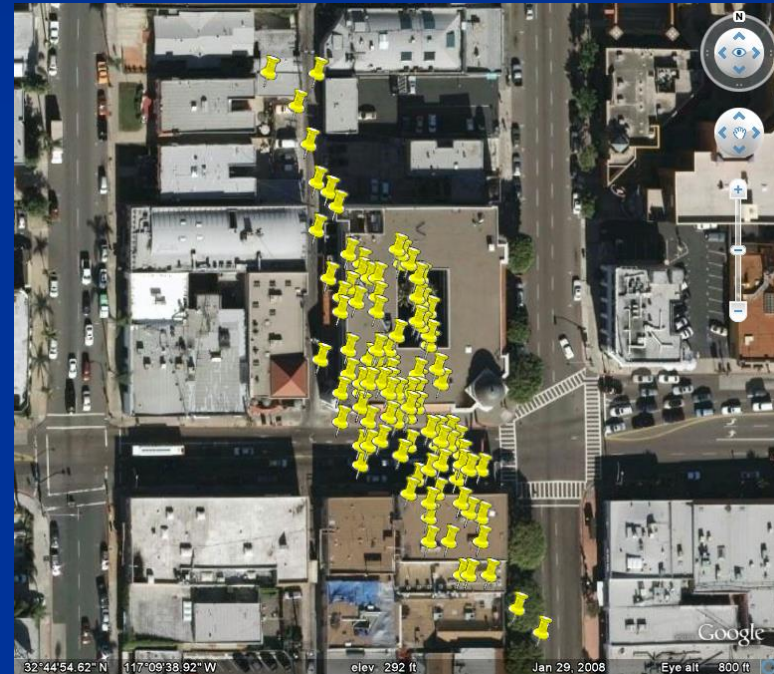
KML  
(Google Earth)

Date	Time	Lat	Lon	Alt	Speed
2009-01-08	03:35:03	39.35071	-76.3926	0.3	0.3
2009-01-08	03:35:34	39.35073	-76.3927	1.5	1.5
2009-01-08	03:36:15	39.35081	-76.3929	1.8	1.8
2009-01-08	03:36:45	39.3509	-76.3929	2.7	2.7
2009-01-08	03:37:15	39.35095	-76.393	10.4	10.4
2009-01-08	03:37:46	39.35225	-76.3931	55.8	55.8
2009-01-08	03:38:10	39.35387	-76.3942	59.3	59.3
2009-01-08	03:38:46	39.35348	-76.3979	21.1	21.1
2009-01-08	03:39:16	39.35633	-76.3978	83.7	83.7
2009-01-08	03:39:46	39.35919	-76.3963	39.76	39.76
2009-01-08	03:40:16	39.35956	-76.3962	7.1	7.1
2009-01-08	03:40:46	39.36029	-76.396	5.3	5.3
2009-01-08	03:41:16	39.35835	-76.3969	71.8	71.8
2009-01-08	03:41:46	39.35555	-76.3981	62.3	62.3
2009-01-08	03:42:16	39.35434	-76.3983	36.4	36.4
2009-01-08	03:42:46	39.35468	-76.4018	68.8	68.8
2009-01-08	03:43:16	39.35518	-76.4046	27.9	27.9
2009-01-08	03:43:46	39.35225	-76.4056	67.8	67.8
2009-01-08	03:44:16	39.34863	-76.4069	88.7	88.7
2009-01-08	03:44:46	39.34507	-76.4052	93.1	93.1

TXT

# Troubleshooting the GPS - Issues

- User Issues
  - Battery Charge
  - Power Button
  - Forgetting Unit
  - Frequent questions
  
- Device Issues
  - Freezing



Functional unit in place for 1 hour



# Troubleshooting the GPS - Strategies

## ■ User Issues

- Detailed instructions
- Research Assistant follow-up
- Meter / GPS Log

## ■ Device Issues

- Rebooting by pulling out batteries

### Information about the GPS Unit

#### How does the unit work?

GPS stands for Global Positioning System. This system uses satellites in space to find and record locations on Earth. Every 30 seconds, it records and stores the time, date and location in its memory. It does not transmit this information to us – we will only see where you have been once we get it back.

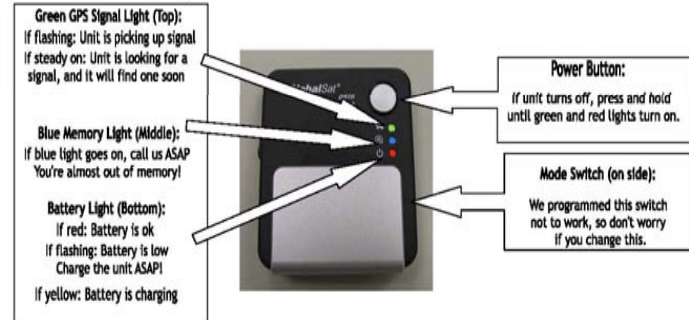
#### Why do I have to set it up on the first day?

When the unit travels a long distance (like from our California office to your home), it takes a bit of time to readjust to its new location. It is important to keep it still at your home for a while so it can "find" the right satellite signals.

#### How can I tell if it's working? What if I notice that the lights are off?

If the green light is flashing, then it is working just fine. If you find that the green light stays solid for a long time, even though the red light is on, please call us! It needs to be reset. If you find that the lights are off, just hold the power button until the red and green lights turn on.

#### What do the buttons, lights and switches mean?



#### What if the battery dies? Will it erase everything?

If the battery dies, the unit will not erase the data that it has already collected. It just won't be able to collect new data. So, make sure you keep it well-charged by putting it on the charger every night before you go to bed.

#### How do I recharge it?

Just plug the unit into its charger, and plug the charger into an outlet. Don't forget to keep the unit on while charging!

#### What if I have more questions?

Call or email us at 1-877-440-4-TEAN, or [teanstudy@projects.sdsu.edu](mailto:teanstudy@projects.sdsu.edu). Please leave a message if you reach the voice mail, and someone will return your call.

# Questionnaire

## How did it go?

Thanks again for your help with our research! We appreciate all your hard work. Now, we'd like to hear what you think! This survey isn't mandatory, and there are no right or wrong answers. Your honest opinions will help make this study better for other kids. Feel free to use the back of this page if you need to. You can use the Business Reply Envelope to send it back to us for free.

Did the GPS turn on and start up ok on the first day? **Yes** **No** **Don't Know**  
If **no**, what did it do?

---

Did the GPS and meter instructions make sense? **Yes** **No**  
If **no** for either, how can we improve the instructions?

---

Did the GPS ever turn off in the middle of the day? **Yes** **No** **Don't Know**  
If **yes**, did you charge it the night before? **Yes** **No** **Don't Know**

How did you use the GPS unit? (please circle 1)

**Clipped to clothing** **Carried in bag or backpack** **Both**



The GPS unit came with a clip. Did you remove the clip? **Yes** **No**

What suggestions do you have to help other kids remember to wear the GPS and meter?

---

What was your favorite part of being in this study?

---

What did your parent think about being in this study?

---

Is there anything else you'd like us to know?

---

Thank you! 

- What motivates you?
  - Incentives most common
- Wearing vs. carrying GPS
  - Most prefer to carry
- Tips for other participants
  - Keep with cell phone, iPod to help remember

Questions?

# Break-out sessions

Station A: Actigraph Equipment & Tracking,  
Erin Merz

Station B: Compliance for Wear Time,  
Carrie Franklin

Station C: Actigraph Data Screening & MeterPlus,  
Kelli Cain

Station D: GPS Data Collection,  
Jill Dumbauld