

The code has been designed using AP Version 8 (8.11.2.54) software.

Data-processing Code

1. Set up the “working directory” folder.

Create a specific folder anywhere on your computer. **The MATLAB codes must be saved in this folder**, as the codes will only read the AP files which are also saved in the folder.

In this folder, you will have three types of files:

1. The MATLAB data processing code (named *main.m*)
2. The participant wear time log (one log per participant)
3. The AP software-generated 15-second epoch file (one file per participant)

You must save the 15-second epoch files and participant logs of all your study participants in this folder. In addition, if you are using the Summary code to compile and average all participant’s files, an additional code must be saved in the same folder:

4. The summary MATLAB code (named *Summary.m*).

2. Prepare the 15-second epoch file for compatibility with the AP code

After the AP device has been connected to the docking port and the data has been uploaded via PALanalysis, select Exports → CSV Exports → and select the 15-second epoch csv file. When the file downloads, it will have a long name comprised of information pertaining to the device and initialization parameters. For example, the downloaded CSV file may have an automatically generated name such as “ID2_112-ID2_112-AP873143 202a 6Dec19 12-43pm for 10d 4h 14m-CREA-PA08110254-15sEpochs.csv” Save this file to your AP working directory folder (where the MATLAB code is saved). **Rename the file** as “*ID#_data.xlsx*”. For example,

for a participant with an ID number of 1 in a study, you would rename the file “*ID1_data.xlsx*”.

Make sure the file is saved as an Excel Worksheet (its name will end in .xlsx).

When the 15-second epoch file is first opened, it will contain 16 unique data columns. The first column is the time column. The AP software encodes the date and time stamps of each 15-second epoch as a “*floating point number*.” To transform this column to a format compatible with the code, in which each cell contains the date and time of the corresponding epoch, follow these steps: Highlight the time column and right click → select “*Format Cells*” → Select the “*Number*” category → Select “*Time*” from the category list → scroll to the bottom on the list in the “*Type Column*” and select the formatting option that reads “*3/14/12 13:30*” → Click “*OK*.” This format converts the floating point number into the corresponding calendar day and time (in military time) of each 15-second epoch. Save the new file. You will need to do this for all your participant’s files. *This is the only alteration that should be made to this file! Do not alter any of the other data columns.*

3. Create the participant wear-time log file

You will need to create a new Excel file for each participant’s wear-time log. In this file you will record both the times the participant reported getting in and out of bed each day, as well as times when the monitor was taken on and off during waking hours. The Excel file will have two columns: “*TimeOn*” and “*TimeOff*”. The cells should be formatted using the same date and time format as the 15-second epoch file. See above instructions on how to properly format the cells. Each file must be named “*ID#_log.xlsx*”. For example, if a participant has a study ID number of 1, then their wear-time log would be named “*ID1_log.xlsx*”. Make sure the file is saved as an Excel Worksheet.

Below is a screenshot of a sample file:

	A	B
1	TimeOn	TimeOff
2	10/25/19 8:23	10/25/19 23:00
3	10/26/19 9:10	10/26/19 23:39
4	10/27/19 8:55	10/27/19 23:14
5	10/28/19 7:16	10/28/19 19:00
6	10/28/19 21:32	10/28/19 22:40
7	10/29/19 7:10	10/29/19 22:20
8	10/30/19 7:15	10/30/19 22:40
9	10/31/19 7:26	10/31/19 19:15

3. Using the code

Once all the study participant files (wear-time logs and 15 second epochs) have been created, formatted correctly and saved in your working directory, go to your working directory and open the MATLAB data processing code. Once open, on the left-hand side of the screen under the “*current folder*” title, will be all the participants’ logs, data files, and the MATLAB code files. Select the MATLAB file ‘*main.m*’ to open it. In the tool bar at the top of the screen, click the green arrow that says “*Run.*” A line of text will appear in the Command Window reading, “*Participant id? (type below and press [Enter])*”. Type ONLY the participant’s ID number (it should be the same number on the log and output file) and press the enter key. If all files are formatted correctly, then in a few seconds a summary of each day will appear in the command window. Additionally, an excel file with all the participant’s activity data will be automatically generated and saved in the working directory folder. This new file will be named “*ID#_output.xlsx*”.

If an error message pops up when you first try to run the code, it is likely because the days in the participant’s log don’t match up (check if entered correctly).

At the end of the output a line of text will read “*Do you have another participant?* [y/n]”. If there are more participant files to process, select “y”. The code will then ask for the next participant ID. The code will repeat this process for each participant’s data file and generate individual output excel files. Once you do not want to process any more files, press the “n” key when the output text reads “*Do you have another participant?* [y/n]”. This will terminate the code. All the generated output files will be automatically saved in the working directory folder. When you are done using the code, you can simply close out of the program- there is no need to save anything (unless you have made modifications, see below).

Here is a screenshot of what a participant’s output file will look like in Excel:

	A	B	C	D	E	F
1	Row	Moving_hm	Sedentary_hm	Standing_hm	LPA_hm	MVPA_hm
2	10/25/2019	2h48	9h35	2h14	0h31	2h14
3	10/26/2019	1h24	8h01	5h04	0h43	0h29
4	10/27/2019	3h21	8h01	2h56	0h42	2h35
5	10/28/2019	1h41	9h40	1h32	0h22	1h17
6	10/29/2019	1h52	10h04	3h14	0h27	1h13
7	10/30/2019	2h21	10h50	2h14	0h32	1h43
8	10/31/2019	0h29	9h27	1h53	0h11	0h16
9	Total average	1h59	9h23	2h44	0h30	1h24
10	Weekday average	1h50	9h55	2h13	0h24	1h21
11	Weekend average	2h23	8h01	4h00	0h42	1h32

Options to modify code

If you want to modify the code, we encourage you to keep the original unmodified in another safe folder and do your modification on a copy of the code. This way you can always revert back to the original if the modifications do not go as planned.

At the beginning of the code ‘*main.m*’ a section entitled ‘*User Specific Parameters*’ gathers three parameters whose value can be modified by the user with minimum risk of creating a bug.

The code is currently programmed to identify a valid day as having 10 hours of wear time. However, this can be modified and changed to other valid-day parameters. Go to line 44 on the code, where you will see the note “*%%% Remove days too short.*” In the line below (line 45) will be the line- “*shortest_day = duration(10,0,0);*” It is here where the code reads if a day meets the minimum number of hours to be considered valid as per the researcher’s criteria. If you would like to change the minimum number of hours, replace “10” with your new value. For example, if you are using a 16-hour 12 minutes and 30 second valid day protocol, then the updated line would read “*shortest_day = duration (16, 12, 30);*” Based off this criteria, if the code identifies a day where the participant logged less than the specific number of minimum hours (i.e. less than 10 hours) it will remove that day from further analyses.

Summary Code

This additional code allows the user to combine all the participants’ outputs into one summary excel file. This file will report all individual outputs and calculate averages for the entire sample. *This code can only be used after all participants’ output files have been generated and saved in the working folder.*

. When you are ready to run the Summary code, open the code in MATLAB and click the green arrow that says “*Run*”. The code will read all the participants output files in the working folder and summarize them. After a few seconds, the code will automatically generate an excel file named “*Summary.xlsx*” and save it in the working folder.

The summary excel file will contain three sheets. The first sheet is named “*total_average.*” Individual rows contain each participant’s average moving, sedentary,

standing, LPA and MVPA time across their entire wear period. The final row is an average of all participants. The second and third sheets are named “*weekday_average*” and “*weekend_average*”, respectively. These sheets report each participant’s weekday and weekend day averages, as well as a sample average.

Below is a screenshot of a batch-scored “*total_average*” Excel output:

	A	B	C	D	E	F
1	ID	Moving_hm	Sedentary_hm	Standing_hm	LPA_hm	MVPA_hm
2	1	2h23	8h01	4h00	0h42	1h32
3	2	2h57	8h04	5h12	1h06	1h37
4	3	2h19	9h12	3h58	0h59	1h16
5	4	1h50	8h52	2h16	0h38	1h08
6	7	2h43	7h28	5h27	1h03	1h25
7	9	2h56	7h41	3h58	1h01	1h49
8	10	2h11	10h32	1h32	0h27	1h43
9	12	3h24	8h20	2h50	0h59	2h22
10	Average	2h35	8h31	3h39	0h52	1h36