

Physical inactivity: results from a pilot study with Mexican youth using mobile accelerometry

The obesity epidemic is a worldwide problem. Studies from the late 20th century show a consistent trend of increasing obesity prevalence on a global scale (Popkin & Doak, 1998). The OECD reports that overweight and obese people are now a majority amongst OECD countries, with Mexico having one of the highest obesity rates: as of 2012, 32.4% of the adult population was obese (Wilson, Devaux, & Cecchini, 2014). Obesity, in turn, is a risk factor to many of the most widespread chronic diseases: diabetes, cardiovascular diseases, and even cancer. We propose that a preventive strategy towards obesity will result in long-term and high impact results. Our strategy focuses on changing two significant lifestyle factors: diet and physical activity. The former is achieved by a comprehensive health education and habit-forming program; the latter, by personalized goal setting based on activity measurements with the use of mobile accelerometry. This work presents the physical activity results of a pilot study realized with Mexican youth. Within this study, we explore the use of the motivational package “Move-your-health®” alongside a series of workshops to validate the hypothesis that personalized goal setting leads to a measurable increase in physical activity.

Physical inactivity: results from a pilot study with Mexican youth using mobile accelerometry

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Background and aims

The obesity epidemic is a worldwide problem. Studies from the late 20th century show a consistent trend of increasing obesity prevalence on a global scale (Popkin & Doak, 1998). The OECD reports that overweight and obese people are now a majority amongst OECD countries, with Mexico having one of the highest obesity rates: as of 2012, 32.4% of the adult population was obese (Wilson, Devaux, & Cecchini, 2014). Obesity, in turn, is a risk factor to many of the most widespread chronic diseases: diabetes, cardiovascular diseases, and even cancer.

We propose that a preventive strategy towards obesity will result in long-term and high impact results. Our strategy focuses on changing two significant lifestyle factors: diet and physical activity. The former is achieved by a comprehensive health education and habit-forming program; the latter, by personalized goal setting based on activity measurements with the use of mobile accelerometry. This work presents the physical activity results of a pilot study realized with Mexican youth. Within this study, we explore the use of the motivational package “Move-your-health” alongside a series of workshops to validate the hypothesis that personalized goal setting leads to a measurable increase in physical activity.

Materials and methods

Study design: Our study consists of three phases: (1) a weeklong measurement of physical activity to create a baseline; (2) four weeks of health education and habit-forming workshops concluding with personalized goals of increased physical activity, and (3) a second weeklong measurement coupled with an assessment of the changes in physical activity. The study consisted of the participation of 12 child volunteers (3 male, 9 female), all of whose tutors signed an informed consent of participation.

Data collection: Baseline and final measurements were carried during one week each using the 3D accelerometer actibelt® (Trium Analysis Online GmbH). After data extraction, measurements were processed with in-house software coded in R to generate a “week-in-a-box” report (see Fig. 1). The report summarizes information with regard to physical activity, including mean daily number of steps, step ratios, time spent at different activity levels, and real life gait speed.

Educational workshops: Volunteers participated in a total of 11 workshops throughout four weeks. Each workshop lasted for one hour 30 minutes and focused on one particular health-related subject. Certified tutors of the Mexican organization Motivate, Experimenta y Transmite Salud A.C. (METAS), carried out the workshops.

Personalized goal setting: After the workshops, each volunteer expressed – in written form – three goals they wanted to achieve with respect to their baseline physical activity. The three goals were reviewed and signed by both the volunteer and the tutor. Exemplary goals included running for two hours during the week, walking at least 35 minutes daily, and increasing the average steps per week by 10%.



Figure 1: Volunteers from a Mexican Public School located in Monterrey, Mexico

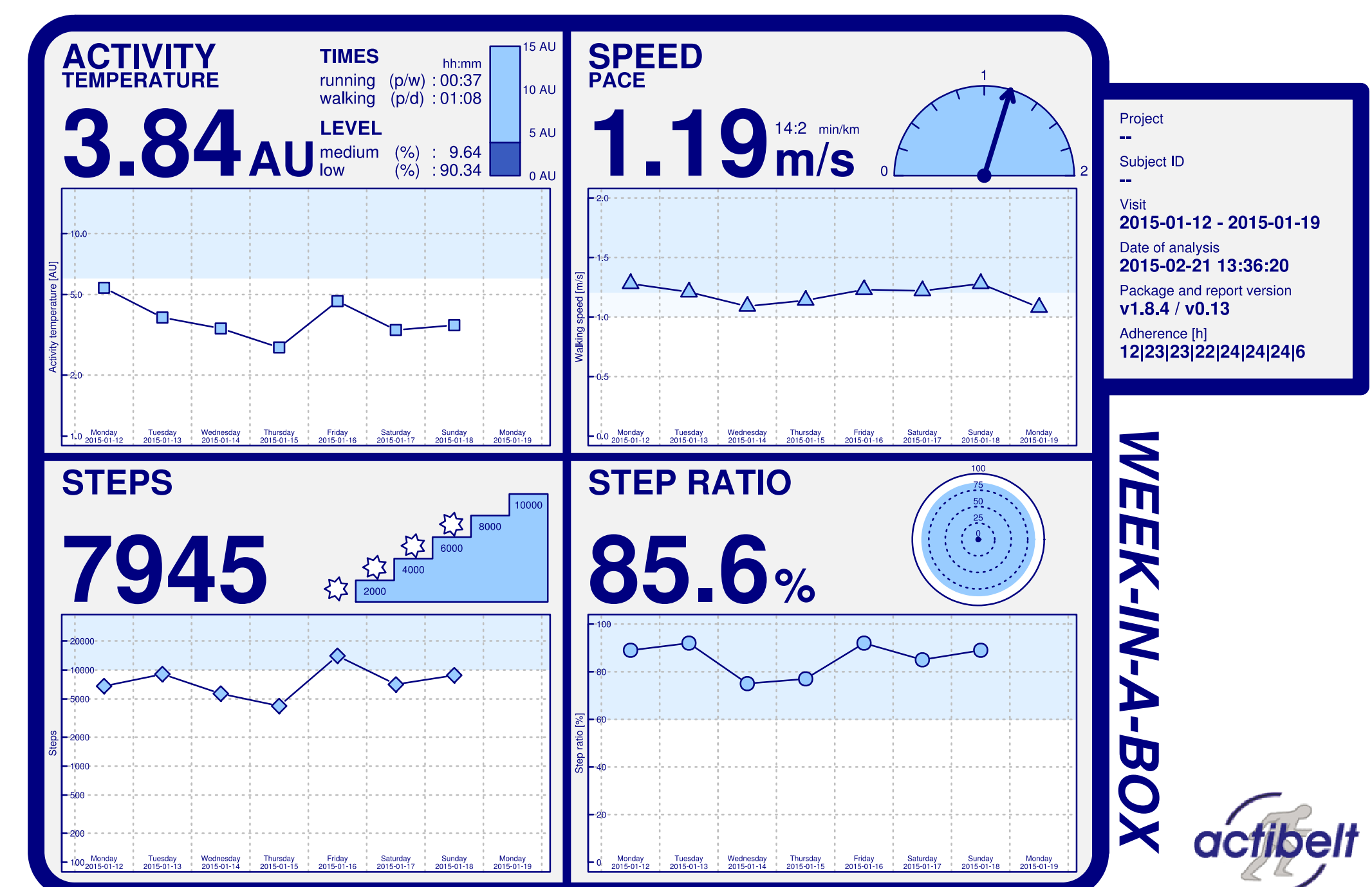


Figure 2: Exemplary “week-in-a-box” report from the baseline week.

Table 1: Baseline results.

#	ID	Activity	Speed	Steps	Step Ratio	Walking (p/d)	Running (p/w)
1	332	3.84	1.19	7945	85.60%	1:08	0:37
2	337	4.61	1.23	6193	68.80%	0:53	0:04
3	362	4.57	1.12	2487	51.12%	0:28	0:04
4	370	4.27	1.12	2545	51.10%	0:25	0:04
6	374	3.65	1.12	1414	64.30%	0:15	0:02
7	384	4.89	1.19	5208	67.40%	0:44	0:18
8	388	3.90	1.09	759	52.20%	0:07	0:00
9	392	3.97	1.37	448	15.70%	0:03	0:00
10	396	3.34	1.02	2579	51.70%	0:25	0:03
11	398	2.78	1.09	1699	58.00%	0:32	0:00
12	571	3.31	1.17	4977	81.80%	0:51	0:00

Table 2: Test results.

#	ID	Activity	Speed	Steps	Step Ratio	Walking (p/d)	Running (p/w)
1	332	4.07	1.16	2516	64.00%	0:31	0:05
2	337	3.71	1.3	3993	77.00%	0:43	0:01
3	372	4.37	1.48	648	40.00%	0:06	0:00
4	374	3.86	1.42	2784	54.00%	0:28	0:04
5	392	4.63	1.03	5321	64.00%	0:47	0:31
6	398	3.33	1.08	5368	85.00%	0:55	0:02

Results

Tables 1 and 2 summarize the results obtained for all 12 volunteers for the baseline and the test week. The missing measurements from the test week are due to technical failure of the software during the data extraction phase. Nonetheless, important conclusions can be drawn with respect to the physical activity of the volunteers in the study. Focusing first on the running time per week, Table 1 indicates that only two volunteers ran more than 15 minutes in the test week, with the rest spending little time at increased activity levels. Table 2 shows no significant increase of the volunteers’ running time. This same statement holds for the rest of the parameters: activity levels are below average and they do not change significantly after participation in health education workshops.

Discussion

Even though the results show low levels of physical activity, their interpretation is not trivial, for there are two important factors that need be considered. First, some volunteers claimed that they participate in daily sports and that their activity measurements seemed too low. Second, the data extraction process suffered from technical malfunctions, being a potential source of measurement error. Beyond the measurement results, we have shown the feasibility of conducting a local interventional study in a youth population, demonstrating the usability of mobile accelerometry for activity measurements.

References

- Popkin, B. M., & Doak, C. M. (1998). The Obesity Epidemic Is a Worldwide Phenomenon. *Nutrition Reviews*, 56(4), 106–114. doi:10.1111/j.1753-4887.1998.tb01722.x
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