## Physical Activity Measurement

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Costs (estimated as of October 2013)</th>
</tr>
</thead>
</table>
| All Activity Monitors | There are many different activity monitors on the market today. Based on studies comparing activity monitors to “gold standard” measures of energy expenditure, most activity monitors seem to accurately assess physical activity among youth ages 2-18 years. | ● Provide a more accurate picture of activity levels compared with self-report  
● Minimal burden on participant  
● Minimal staff resources required to collect activity monitor data | ● Unable to detect certain forms of activity, depending on wear location  
● Devices dependent on specific software are less accessible  
● Technology changes rapidly | ● More features = higher cost  
● More software and support = higher cost                                                                                                           |
| Accelerometer    | Accelerometers track movement in up to three dimensions and record acceleration, or speed and direction of movement over time, in pre-determined intervals | ● Capture patterns of activity (frequency, intensity, and duration of activity)  
● Can detect activity in small time-stamped windows  
● Provide flexibility in analyzing data different ways  
● Body size does not influence counts  
● Wireless setup and download possible | ● Expensive  
● Data management & analysis require expertise & labor  
● Outputs device-specific units (i.e., intensity counts) that need to be calibrated with meaningful units for interpretation | ● Actigraph wGT3X+: $249/monitor + $8/USB cable + $1,295/ ActiLife software license  
● FitLinxx Pebble: $36/monitor + $9/USB link + $715/online software account  
www.actigraphcorp.com  
www.fitlinxx.net                                                                                           |
| Pedometer        | Pedometers track movement in one dimension (up and down) and record accumulated steps taken.                                                                                                             | ● Inexpensive  
● Useful for capturing volume of activity performed (i.e., steps)  
● Outputs well-understood units (i.e., steps) for easy interpretation  
● Models with open display screen may motivate behavior change | ● Cannot assess frequency, intensity, or duration  
● Body size and movement speed influence step counts  
● Not all models have data storage capacity | ● Omron HJ-322U: $45/monitor + Free online software  
omronhealthcare.com/home-products/fitness  
● Accusplit AE120XL: $25/monitor  
www.accusplit.com                                                                                       |

## HPRC Projects Using Technology in Physical Activity Measurement, and Additional References


Active School Day: [http://www.hsph.harvard.edu/prc/projects/active-school-day/](http://www.hsph.harvard.edu/prc/projects/active-school-day/)


## Community Partners Meeting

### Examples of Current Technology Used for Obesity Research

#### Diet Measurement

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Costs (estimated as of October 2013)</th>
</tr>
</thead>
</table>
| All Photography       | Photography is increasingly used as a diet measurement tool, in comparison with recall, record, or direct observation of eating occasions. The plate waste photography method has shown to accurately assess children’s setting-specific dietary intake, and other methods need further investigation. | ● Improves on accuracy of recall, which is poor among children  
● Potential to link directly to large databases of food and beverage information for off-site data analysis | ● Battery life may be limited  
● Participant-initiated photography may lack completeness  
● Observer-initiated photography requires outside resources  
● Automated photography is expensive and not easily scalable | ● No added device cost if using mobile phone  
● Labor cost of photograph processing & image assessment |
| Plate Waste Photography | Trained observers take photographs of meals before and after consumption and later assess (off-site) the proportion of each food and beverage item consumed. | ● Useful for measuring intake in groups and specific settings outside the home  
● Minimal burden on participant  
● Inexpensive | ● Not optimal for capturing total daily dietary intake | ● For labor associated with assessing plate waste: $0.59/observation of one plate  
● Assumes observer uses pre-existing mobile phone to take photographs |
| Mobile Phone Food Record | Similar to traditional food records, individuals record each food and beverage consumed throughout the day, except written records are replaced with photographic records. | ● Useful for measuring total daily dietary intake  
● Inexpensive  
● Accessible given the abundance of mobile phones | ● Relies on participant to take photos, so greater chance for gaps in data  
● Privacy concerns if other people are in view  
● Participant may not be trained to capture appropriate view of food | ● Depends on how automated vs. manual photograph processing is  
● Assumes participant uses pre-existing mobile phone to take photographs |
| Wearable Camera       | Wearable cameras, which are clipped to clothing or worn on a lanyard around the neck, automatically take photographs at regular intervals throughout the day to capture a person’s surroundings. | ● Useful for measuring total daily dietary intake  
● Minimal burden on participant  
● Automated, no training required | ● Expensive, may not be feasible for assessment among large groups  
● Privacy concerns if other people are in view | ● Depends on how automated vs. manual photograph processing is  
● Narrative Clip: $279/ device getnarrative.com |

### HPRC Projects Using Technology in Diet Measurement, and Additional References


