AndWellness: an open mobile system for activity and experience sampling

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Introduction: How To Use Ecological Momentary Assessment For Behavior Change

Ecological Momentary Assessment

- EMA is the act of sampling activity and behavior in the moment.
  - Reduces time between activity and sampling to reduce the phenomena called recall bias introduced by retrospective sampling (Shiffman 1997, Lemmens 1998).
  - Validates psychological theories that require the resolution of everyday sampling or higher (Shiffman 2008).
  - Measures how individuals vary over time and helps to discover correlations that relate these variations (Swendsen 2000).
- AndWellness uses smart phones to enable rapid exploration in this space of in situ health and wellness data collection.

Motivating Continued Adherence

- EMA methods have a well documented decrease in participant motivation after 2 to 4 weeks due to user burden.
- AndWellness is designed with feedback from both researchers and potential participants to reduce user burden and to maintain motivation over time.
- Continued adherence to EMA studies can positively modify participant behavior over time.
  - For example: monitoring diet, exercise, mood/stress, medication adherence, and other health indicators.

Focus Groups and Pilot: Advice From Participants For Design Requirements

Focus Group Feedback

- Three focus groups to identify user design requirements for attractive, engaging design.
  - Individual customization of prompts and triggers to account for each participant’s unique lifestyle.
  - Collection of images and other multimedia data types for increased accountability.
  - Individual goal setting and real-time process monitoring on the smart phone itself.
  - Innovative stress button functionality reduces user burden.
  - Press a single button to record the time and location of a stressful event.

Participation in ABC Pilot

- Pilot study to validate survey data and obtain initial participation numbers.
- Surveyed breast cancer survivors to obtain mood, stress, exercise, and sleep data.
- Correlate survey data against salvia based biomarkers to ensure the data are a reliable indicator.

Feedback from participants indicates the need for smarter, more configurable triggers and clear reminders that are easy to understand.

AndWellness System: Components To Motivate Continued Participation

Smart Phones For EMA Data Collection

- Many users already integrate smart phones into their daily lifestyle.
- Three innovative functions to harness smart phone functionality:
  - Automated activity trace to provide continuous, unobtrusive logging of a participant’s activity.
  - Contextual probes to remind participants to record an assessment.
  - Real-time feedback to track and encourage progress towards behavior change goals.
- All components designed with the goal of motivation and participation.

End-to-end System Implementation

Campaign Data Flow

Validation: Ensuring AndWellness Collects Accurate And Reliable Data

Comparing AndWellness And Accelerometer Data

- Each study both validates phone data against a baseline and studies behaviors not measurable without EMA methods.
- NIH funded study follows 60 young mothers:
  - Monitors stress, diet, and exercise.
  - Random time-based triggers to obtain a baseline survey response rate.
  - Add individually tailored time and location triggers to measure improved response rate.
  - Add real-time goal tracking to again measure a hypothesized improved response rate.

Current Studies

- Study: Accelerometer validation study
  - Reduced by disease in months
  - NIH trial vs H1N1
  - Breast cancer screening
  - Sedentary in immigrant women

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Size</th>
<th>Diet</th>
<th>Exercise</th>
<th>Mobility</th>
<th>Alcohol</th>
<th>Drug</th>
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