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Multiple Input Modes for Context Appropriate Diet Reporting

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Background

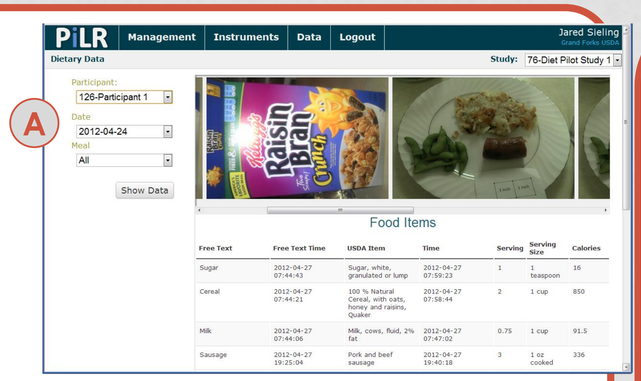
Systematic error (bias) in reporting dietary intake decreases when conducted closer to an eating event. However, concurrent reporting can increase participant burden, leading to missed or incomplete reports, or alter behavior in incompatible environments. Studies have found that compliance can be increased when mobile devices are used. However, all past studies imposed a single input method for all participants and in all contexts.

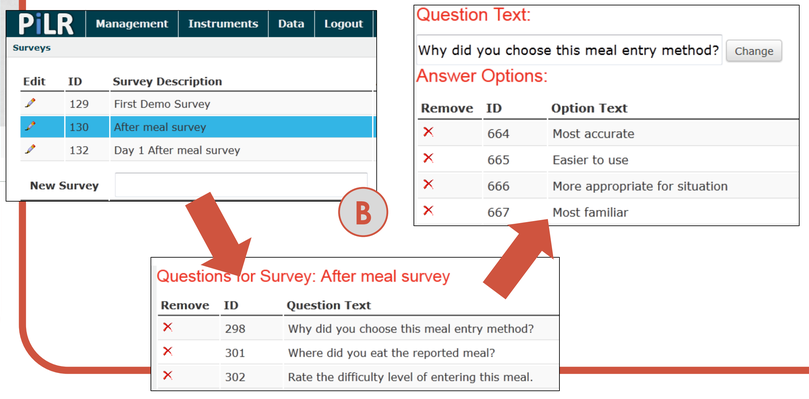
Context appropriate - Presenting multiple diet intake methods is a capability unique to programmable mobile devices (i.e., Smartphones). This gives study participants the flexibility to employ a method most suited to context. Context influences can include familiarity, dexterity and cognitive approach. It also includes being situationally appropriate, such as a photo and brief description for later elaboration, surreptitious text entry when a flash photo would not be appropriate.

Dashboard and EMA

The dashboard is an interface for investigators to register participants, assign devices and EMA, monitor the study and review data.

A. A diet record shows images, text entries, and database matches in real-time.
B. Investigators set up survey (EMA) questions and options, and deploy them to participant through a web portal.
C. Smartphone status, participant actions and time + location of food entry and EMA are logged.





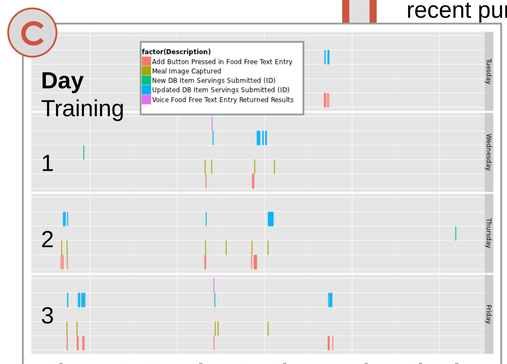


Figure 1. Food entry time and method. Time series of logged meal submissions.

Results

Six dietary intake input methods were developed that can be enabled by investigators and used singly or in combination by participants:

- typing in food descriptors
- record voice for later playback
- speech-to-text conversion with food item extraction
- capture and annotate meal photos
- capture food label / nutrition facts / barcode photos
- select from recently consumed food sets.

Trial: Six women and 2 men (42 – 57 y.o., mean 49). All but 1 completed 3 days. All had participated in a diet study, but never on an electronic device. Only two had exposure to smartphones, from recent purchases.

Participants or study staff could use information from any method to match foods in FNDDS either when consumed or later. Reports were sent wirelessly to investigators and could be used for multiple-pass entry (e.g., recall interview supported by earlier inputs). All participants used at least 2 methods chose to lookup foods in the FNDDS (see experience by time in Figure 1). Six of 8 participants had difficulty with the FNDDS for food match and serving size. 2 had technical difficulties that limited use of phone functions or entry methods. All but 2 participants felt it was beneficial to have more than 1 input method. Five of 8 were interested in using an electronic system to monitor diet and activity for weight change.

Study Design

Participants

Eight adults were recruited from the USDA/ARS Grand Forks Human Nutrition Research Center (GFHNRC).

Procedure

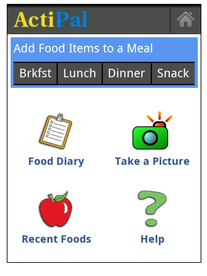
Participants were given a Motorola Defy smartphone or used their own Android phone. They were asked to use the ActiPal™ application containing the USDA Food and Nutrient Database for Dietary Studies (FNDDS) database to record dietary intake for three days and answer a surveys after each submission. Matching foods to the database was not required. The first day was "scripted" so that participants were exposed to the same four entry methods. Participants received the script and watched a training video for training.

The scripted steps included:

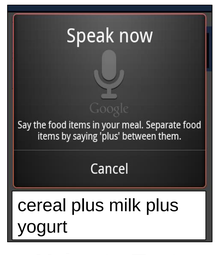
1. Enter "free text" descriptions
2. Take pre-meal photo/s
3. Take post-meal photos
4. Look up entered "free-text" meal items in food database

On days 2 and 3 participants had free choice to use any method. After the trial they completed a detailed questionnaire on their experience.

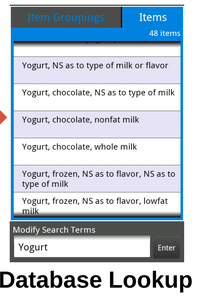
Mobile Application



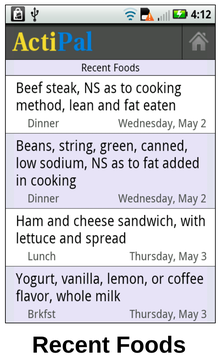
Food Entry Menu



Voice to Text



Database Lookup

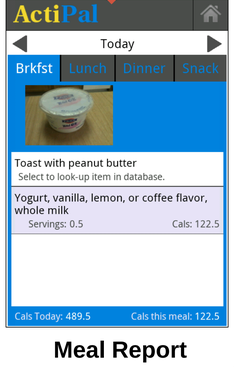


Recent Foods

B

The mobile application allows participants to intake in multiple ways. From the **Food Entry Menu** screen, the participant can:

A. Dictate meal items and use the voice-to-text function, then lookup the items in the database, or
B. Browse recently enter foods and select an item they consumed again today, then add serving information.



Meal Report

Discussion

In general, participants appreciated choice and flexibility in diet entry methods and were comfortable with an electronic device. From the comments it was clear that 3 days was too short a time for people to become facile with multiple methods without more intensive training. Further, we failed to communicate that with images (or voice record, which wasn't used) it is not necessary to match every food item and quantity to the FNDDS stored on the phone. Participants' attempts to immediately record exact and detailed records was a cause of dissatisfaction.

Technical problems unnecessarily distracted from initial exposure to entry methods. A controlled environment should be provided for training. And users should be encouraged to seek support.

Conclusion

Using multiple input modes is technically feasible and can reduce reporting time and increase participant satisfaction when employed carefully. However, using this "N-of-1" approach may conflict with principles in study design that every episode be measured in the same way to minimize unknown errors.

Disclaimer and Contact

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