Smart and ICT-assisted devices for dietary assessment—when will traditional paper based methods be retiring

Bente Egilberg Mikkelsen
Nestle Research Centre, Lausanne, December 7, 2017

Abstract:
Data collection in dietary intake studies using traditional methods is costly and time consuming. As a result ICT assisted measurement of dietary behavior has attracted interest from the nutrition research community and a number of groups across the world has through different trajectories tried to reduce the workload related to determining food intake. The aim of the symposium is to present the current state of play within smart ICT assisted devices for automated dietary data assessment—here referred to as Realtime Dietary Assessment Technologies (RDAT).

Who is active in this field?
- Newcastle, AUS
- Wageningen, NL
- ETH Zurich, CH
- Pittsburgh University, US
- Dundee University, UK
- Jose Stefan Inst, SI
- USDA, US
- Aalborg University, DK
- Karolinska, SE

Commercial applications not validated

European research centres from the Richfields Design Study

Two approaches to technology assistance

- Web or app based DIY
  - Converting the paper based into something screen based
  - Uses only the computer

- Technology assisted
  - Using a "replacement of human" approach
  - Uses distal technology like scales, imaging, RF, barcodes etc.

Case study on laboratories and facilities

One slide about Denmark

No one can work alone

The eButton approach

Commercial applications not validated
So, how does it work? While the company chalks it up to “magic”, we’re assuming they’ve got a handful of people (be it through Amazon’s Mechanical Turk, or a room full of dudes promised free Internet in exchange for calorie counting) breaking down the meal in your picture item by item. Snap a shot of a chicken salad? They punch in some chicken, some lettuce, maybe some dressing—and bam, they’ve got a rough estimate.

Is it a precise science? Hardly. Even in the screenshot above, you can see that there are some pretty wild variations. A “Small handful of cashews”, for example, comes back as being anywhere from 150 to 614 calories. Still, having some idea of what you’re taking in is still far better than not having any idea at all.

You can find MealSnap on the App Store for $2.99 right here [iTunes link].

Other approaches
- ASA24 – Automated Self Administered 24hdr
- TADA: Technical Assisted Dietary Assessment
- Diet Data Review System (DDRS)
- Smart Plate
- Smart Fork
- TelSpec


http://www.tadaproject.org/

From DIMS1.0 to 1.5

Input mode
- Dimensions
- Intake
- Waste

Output mode
- Pre‐serve
- Post‐serve
- Intake
- Waste

DIMS ver 2.0
on the go design

Is the DIMS robust in practice?
The Herlev stress test

Is the DIMS saving time?
The Aalborg feasibility study
- Reduces the time spent on NM from 15 to 4 minutes
- Patients at nutritional risk produced increased amounts of plate waste, with less energy & protein intake when compared to patients not at nutritional risk.
- It can be used in co‐creation mode improving accuracy
Is the DIMS accurate?
Validation Study 1: Herlev Hospital

Intervention:
• Front End Nutrition & Meal support
• Meal hosting

Results:
• No significance pre- og post test
• DIMS functions well with a trained operator
• Meal hosting requires training

Acknowledgment: catering manager Michael Allerup Nielsen

Is the DIMS accurate?
Validation 2: Odense University Hospital

Hypothesis
• High correlation between DIMS data and standard weighed method

Results:
• Correlation: DIMS total energy/standard total energy (r = 0.990 and p value = 0.01)
• Correlation: DIMS total protein/standard total protein (r = 0.974 and p value = 0.01)

Acknowledgements: Dr. Rudolf Albert Scheller, Geriatric DeptG, Odense Ofie. KO, ulAin, Q, Sceheller, R & Mikkelsen, BE:

Shared nutrition decision making
Nutritionalsupport with the NutriDia

Conclusion
• R&D is still 10 years behind PA measurement
• New opportunities in image capture
• Cognitive computing can now recognise food images
• Smart scales are getting smaller
• New shortcuts offered by bar codes
• Solutions need to be multi technology
• Solutions in protected environments are easier