Development Of A Self-Administered Automated 24-hour Dietary Recall (24HR) For Use In Large-Scale Nutrition Research

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NCI’s Vision for an Automated Self-Administered 24-Hour Recall (ASA-24)

- 24HRs that are automated **AND** self-administered:
  - Complete system for probing, coding, and analysis
  - Accessible on the web, publicly available
  - Easily updated

- Adaptable to multiple languages

- Modeled after dietary surveillance systems in NHANES (AMPM)

- Multiple 24HRs could be collected for minimal cost
Cognitive/Usability Testing

• Use AMPM as a guide to self-administration on the computer
  – What works visually?
  – Preferences?
  – Understandable?

• Quick List Pass
  – Finding foods by browsing or typing

• Detail Pass
  – Multiple follow-up questions
Initial Formative Research

• Two Quick List (QL) versions
  – Unstructured QL: free recall before sorting into meals (most like AMPM)
  – Meal-based QL: unstructured recall by meal

• Tested both versions to:
  – Assess general preferences
  – Assess influences on memory and recall
  – Identify early usability issues
  – Develop preliminary suggestions for further development and research
Findings – Preferences

- Meal-based version preferred
- Most participants reported features they liked about both versions
  - Both versions carried forward
- Chronological report common

Paper Prototype Cognitive Test

Methods

• Small group testing
  – Qualitative focus
  – Led by cognitive psychologist
  – 2 - 5 participants per session
  – Screen shots (paper prototypes) projected on wall
  – System not functional/not graphically enhanced
  – Cognitive walk-through w/participant comments
  – Debriefing
Paper Prototype Round 1

Objective: Assess QL Preferences

• Finding food to report: two options
  • Browse for food selections
    – Vertical tree (A)
    – Horizontal columns (B,C)
  • Type and Search
• When to report time of eating occasion
• Reaction to agent and food photography
If this is the correct food, you can add it to your selections list by clicking the "OK" button.
Thank you.
Now, please click on each of the gray icons in your selections list to organize what you ate and drank.
Baked good
Beans, peas, nuts, soy products
Beverages
Breads, rolls and tortillas
Casseroles, mixtures, frozen foods
Cereals and energy bars
Condiments, Salsa, Sauces
Dairy
Eggs
Fast Foods
Fats, Oils, Dressings, Spreads
Fish, shellfish
Fruit and fruit juice
Meat
Pancakes, waffles, flapjacks, crepes
Poultry
Rice and other grains
Salads
Salty snacks
Sandwiches

Breakfast : 9:00 AM : Home
- Healthy Choice Almond Crunch cereal
- Milk
Lunch : 12:30 PM : Someone else’s home
- Cheddar cheese
- Croissant
- Tuna salad sandwich
- Apple
- Poland Spring bottled water
Snack : 3:00 PM : Vending machine
- Mr. Goodbar chocolate bar
Supper : 4:00 PM : Home
- Betty Crocker Hamburger Helper

Excellent!
You can change any of your entries by clicking on it.

Click the STOP button when you have finished entering everything you ate or drank yesterday from midnight to midnight.
Cheese, limburger
Soup, sirloin burger with vegetables, ready-to-serve, single brand
Pickle, relish, hamburger
Rolls, hamburger or hot-dog
Interstate Brands Corp., Wonder Hamburger Rolls
Cheeseburger
Hamburger
Totino’s Pizza Rolls Pizza Snacks, Hamburger, frozen
Betty Crocker Hamburger Helper cheeseburger macaroni, dry mix
Worthington Foods, Morningstar Farms Better’n Burgers, frozen
Worthington Foods, Natural Touch Vegan Burgers, frozen
Green Giant, Harvest Burger, Original Flavor, All Vegetable Protein Patties...
Worthington Foods, Morningstar Farms “Burger” Crumbles
Worthington Foods, Morningstar Farms Spicy Black Bean Burger

If this is the correct food, you can add it to your selections list by clicking the “OK” button.

Click the STOP button when you have finished entering everything you ate or drank yesterday from midnight to midnight.
Scheme B

Paper Prototypes Cognitive Testing: Round 1

Quick List
### OCCASIONS
- Before breakfast
- Breakfast
- Lunch
  - Snack after lunch
  - Just a drink after lunch
- Supper
- Dinner

### FOOD GROUPS
- **Baked goods**
  - Beans, peas, nuts, soy products
  - Beverages
  - Breads, rolls and tortillas
  - Casseroles, mixtures, frozen foods
  - Cereals and energy bars
  - Condiments, Salsa, Sauces
  - Dairy
  - Eggs
  - Fast Foods
  - Fats, Oils, Dressings, Spreads
  - Fish, shellfish
  - Fruit and fruit juice
  - Meat
  - Pancakes, waffles, flapjacks, crepes
  - Pasta, noodles, and spaghetti
  - Poultry
- Rice and other grains

### MY SELECTIONS

---

Great!
Now, please select what you had to eat or drink.
You can scroll up and down through foods by using the ▲ and ▼ buttons.
Click the ▼ and ▶ buttons to scroll into and out of food sub groups.
Click the STOP button when you have finished entering everything you ate or drank yesterday from midnight to midnight.
Scheme C

Paper Prototypes Cognitive Testing: Round 1
Quick List
Select foods by browsing or typing

### OCCASIONS
- Before breakfast
- Breakfast
- Lunch
- Supper
- Dinner

### FOOD GROUPS
- Baked good
- Beans, peas, nuts, soy products
- Beverages
- Breads, rolls and tortillas
- Casseroles, mixtures, frozen food
- Cereals and energy bars
- Condiments, Salsa, Sauces
- Dairy
  - Eggs
  - Fast Foods
  - Fats, Oils, Dressings, Spreads
  - Fish, shellfish
  - Fruit and fruit juice
  - Meat
  - Pancakes, waffles, flapjacks, crep...
  - Poultry
  - Rice and other grains
  - Salads

### FOOD SUB GROUPS
- Cheese
  - Cream, creamers
  - Dip
  - Ice cream, frozen yogurt, sundaes
  - Milk, all types
  - Milk drinks
  - Pudding, custard, flan, etc.
  - Rice milk, rice drinks
  - Soy milk, soy drinks
  - Sour cream
  - Whipped cream, whipped toppings
  - Yogurt
  - Other

### FOODS
- Alpine Lace Cheese
- American cheese
- Asiago cheese
- Beer cheese
- Blue or Roquefort cheese
- Borden Lite Line cheese
- Brick cheese
- Brie cheese
- Chedarella cheese
- Cheddar cheese
- Cheddar cheese
- Cheese (unknown kind)
- Cheese spread

If this is the correct food, you can add it to your selections list by clicking the "OK" button.
Select foods by browsing or typing

1. OCCASIONS
   - Before breakfast
   - Breakfast
   - Lunch
   - Supper
   - Dinner

2. FOOD GROUPS

3. FOOD SUB GROUPS

4. FOODS

5. MY SELECTIONS
   - Lunch 12:30 PM Some else's home
   - Cheddar cheese

Good job!
What else did you eat or drink?

Click the STOP button when you have finished entering everything you ate or drank yesterday from midnight to midnight.
Select foods by browsing or typing burger

1 OCCASIONS
- Before breakfast
- Breakfast
- Lunch
- Supper
- Dinner

2 FOOD GROUPS

3 FOOD SUB GROUPS

MY SELECTIONS
- Breakfast: 9:00 AM: Home
  - Healthy Choice Almond milk
  - Milk
- Lunch: 12:30 PM: Someone...
  - Cheddar cheese
  - Croissant
  - Tuna salad sandwich
  - Apple
  - Poland Spring bottled water
- Snack: 3:00 PM: Vending machine
  - Mr. Goodbar chocolate bar
- Supper: 4:00 PM: Home
  - Betty Crocker Hamburger...

SEARCH RESULTS
- Cheese, limburger
- Soup, sirloin burger with vegetables, ready-to-serve, single brand
- Pickle, relish, hamburger
- Rolls, hamburger or hot-dog
- Interstate Brands Corp., Wonder Hamburger Rolls
- Cheeseburger
- Hamburger
- Totino’s Pizza Rolls Pizza Snacks, Hamburger, frozen
- Betty Crocker Hamburger Helper cheeseburger macaroni, dry mix
- Worthington Foods, Morningstar Farms Better’n Burgers, frozen
- Worthington Foods, Natural Touch Vegan Burgers, frozen
- Green Giant, Harvest Burger, Original Flavor, All Vegetable Protein Patties...
- Worthington Foods, Morningstar Farms “Burger” Crumbles

If this is the correct food, you can add it to your selections list by clicking the “OK” button.

Click the STOP button when you have finished entering everything you ate or drank yesterday from midnight to midnight.
Paper Prototype Round 1

Lessons Learned

• Vertical vs. horizontal browsing
  – No clear preference
  – Horizontal browsing
    ▪ Second scheme (*iPod model*) mouse scroll buttons confusing

• Reporting times for eating occasion
  – Strong preference to report meals/times first and only once
  – Slight preference to report times before food selection
Paper Prototype Round 1

Lessons Learned

• Opinions about Agent and food photography
  – Agent was generally accepted
  – Differences in acceptance of food photography

• Search and type box should be placed above location of food categories
Paper Prototype Round 2
Objectives: Assessing Revised Schemes

• Three *Browse* models
  – 1/2 screen *Foods* vertical tree (D1)
  – Full screen *Foods* vertical tree (D2)
  – Horizontal columns (*iTunes* model, E)

• Modified versions of (*Agent*, food photography)
Scheme D1

Paper Prototypes Cognitive Testing: Round 2
Quick List
### Meals

<table>
<thead>
<tr>
<th>Breakfast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunch</td>
</tr>
<tr>
<td>Lunch</td>
</tr>
<tr>
<td>Dinner</td>
</tr>
<tr>
<td>Supper</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Snack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Just a drink</td>
</tr>
</tbody>
</table>

### Foods: Dairy: Cheese

- Baked good
- Beans, peas, nuts, soy products
- Beverages
- Breads, rolls and tortillas
- Casseroles, mixtures, frozen foods
- Cereals and energy bars
- Condiments, Salsa, Sauces

### Dairy

- Cheese
  - Alpine Lace Cheese
  - American cheese (low sodium)
  - Asiago cheese
  - Beer cheese
  - Blue or Roquefort cheese
  - Borden Lite Line cheese
  - Brick cheese
  - Brie cheese
  - Chedarella cheese
  - **Cheddar cheese**
  - Cheese (unknown kind)

**Click the SELECT button if you had cheddar cheese.**

"Cheddar cheese."

This picture may not be an exact match, but that's okay.
Click the SELECT button if you had cheeseburger.
Scheme D2
Paper Prototypes Cognitive Testing: Round 2
Quick List
“Cheddar cheese.”

This picture may not be an exact match, but that's okay.

Click the SELECT button if you had cheddar cheese.
Scheme E

Paper Prototypes Cognitive Testing: Round 2
Quick List
“Cheddar cheese.”
This picture may not be an exact match, but that’s okay.
Click the SELECT button if you had cheddar cheese.
Click the STOP button when you have finished entering everything you ate or drank yesterday from midnight to midnight.
Paper Prototype Round 2

Lessons Learned

• Vertical vs. horizontal browsing
  – No clear preference

• Vertical browsing
  – Preferred full column to 1/2
  – Preferred My Selections on right side of screen

• Food photography
  – Participants did not think images facilitated building My Selections for Quick List
Paper Prototype Round 3

Objectives: Assessing Revised Schemes and Probes (Detail Pass)

- First assessment of food probes
- Horizontal versus vertical navigation for probes
- Assess food photography
Scheme D2

Paper Prototypes Cognitive Testing: Round 3
Detail Pass
Here are the details of what you have selected.

If this is correct, click the NEXT button to continue.
Scheme E

Paper Prototypes Cognitive Testing: Round 3
Detail Pass
<table>
<thead>
<tr>
<th>Sauce?</th>
<th>Prepared with fat?</th>
<th>Other Additions?</th>
<th>Amount you ate?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No sauce</td>
<td>No fat or oil used</td>
<td>Yes</td>
<td>1/4 cup</td>
</tr>
<tr>
<td></td>
<td>Animal fat/drippings</td>
<td>No</td>
<td>1/2 cup</td>
</tr>
<tr>
<td></td>
<td>Butter</td>
<td>Don’t know</td>
<td>3/4 cup</td>
</tr>
<tr>
<td></td>
<td>Margarine (including spreads)</td>
<td>Don’t know</td>
<td>1-1/4 cups</td>
</tr>
<tr>
<td></td>
<td>Oil (any kind)</td>
<td></td>
<td>1 cup</td>
</tr>
<tr>
<td></td>
<td>Shortening</td>
<td></td>
<td>1-1/2 cups</td>
</tr>
<tr>
<td></td>
<td>Other fat or oil</td>
<td></td>
<td>1-3/4 cups</td>
</tr>
<tr>
<td></td>
<td>Unknown fat or oil</td>
<td></td>
<td>2 cups</td>
</tr>
<tr>
<td></td>
<td>Don’t know if fat or oil was used</td>
<td>Don’t know</td>
<td>More than 2 cups</td>
</tr>
</tbody>
</table>

Here are the details of what you have selected.

If this is correct, click the NEXT button to continue.
Paper Prototype Round 3

Lessons Learned

• 6 of 8 participants preferred vertical tree browsing to horizontal

• Most participants preferred
  – Fewer selections on screen
  – Shading vs. bolding for highlighting selections

• Most participants said they did not attend to food photography
Current Scheme
<table>
<thead>
<tr>
<th>MEALS</th>
<th>MY SELECTIONS</th>
<th>FOODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dinner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Just a drink</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please tell me what you had to eat or drink yesterday, Richard. Let's start with the kind of meal it was.

*Click on a meal, Snack or Just a drink from this list.*
“Lunch.”

What time did you eat lunch?

Select the **hours**, **minutes** and whether lunch was **AM** or **PM**.

Click the **go** button when you are finished.
Okay... so, what did you have to eat or drink for lunch?

You can tell me the food by clicking on a **FOODS** category in this list. Or, you can type the name of a food in the search box above.
Click the disclosure triangle to reveal or hide more choices.
“Soda, pop, soft drinks.”

This list is longer. Use your mouse to drag the scroll bar and you will see the rest of the list.

Click on a **food** to see its picture.
“Coke (regular).”

This picture may not be an exact match, but that’s okay.

Click the SELECT button at the bottom if you had Coke (regular).
You can add more foods and drinks to your lunch.

You can tell me the food by clicking on a **FOODS** category in this list. Or, you can type the name of a food in the **search** box above.

You can also click on a different **meal**, **Snack** or **Just a drink**.
You can add more foods and drinks to your supper.

You can tell me the food by clicking on a FOODS category in this list. Or, you can type the name of a food in the search box above.

You can also click on a different meal, Snack or Just a drink.

Breakfast: 9:00 AM
- Healthy Choice Almond Crunch cereal
- Croissant (plain)
- 2% milk

Lunch: 12:30 PM
- Coke (regular)
- Cheeseburger
- Green beans

Snack: 3:00 PM
- Mr. Goodbar chocolate bar
- Poland Spring bottled water

Supper: 4:00 PM
- Betty Crocker Hamburger Helper

Foods:
- Beans, peas, nuts, soy products
- Beverages
- Breads, other baked goods
- Cereals and energy bars
- Chicken, turkey, poultry
- Condiments, Salsa, Sauces
- Dairy, dairy substitutes
- Desserts and sweets
- Eggs
- Ethnic Foods
- Fats, Oils, Dressings, Spreads
- Fish, shellfish
- Fruit
- Meat
- Pancakes, waffles, crepes
- Pasta, noodles, and spaghetti
- Rice and other grains
- Salads
- Salty snacks
- Sandwiches
- Soup
- Sugars and sweeteners
- Vegetables and vegetable juice
You clicked the STOP button to indicate you have finished entering everything you ate or drank yesterday from midnight to midnight.

If this is correct, click the OK button. If not, click the CANCEL button.

Click the STOP button when you have finished entering everything you ate or drank yesterday from midnight to midnight.
Now we’ll go through each of your food selections meal by meal to get more detailed information.

We’ve already completed Breakfast, so let’s move on to Lunch.
Your next food is “Green beans.”

How were the green beans prepared?

Please click an option.
Was it **fresh, frozen, canned, or dry?**

*Please click an option.*

**Breakfast:** 9:00 AM
- Coke (regular)
- Cheeseburger
- Green beans

**Lunch:** 12:30 PM
- Mr. Goodbar chocolate bar
- Poland Spring bottled water

**Supper:** 4:00 PM
- Betty Crocker Hamburger Helper

**Preparation?**
- Cooked
- Creamed
- Pickled
- Raw
- Don't know

**Type?**
- Canned
- Fresh
- Frozen
- Other
- Don't know
Was it cooked with a sauce?

*Please click an option.*

- **Breakfast:** 9:00 AM
  - Coke (regular)
  - Cheeseburger
  - Green beans

- **Lunch:** 12:30 PM
  - Mr. Goodbar chocolate bar
  - Poland Spring bottled water

- **Snack:** 3:00 PM
  - Betty Crocker Hamburger Helper

- **Supper:** 4:00 PM
  - Green beans (sauce?请选一个选项）

**Preparation?**
- Cooked
- Creamed
- Pickled
- Raw
- Don’t know

**Type?**
- Canned
- Fresh
- Frozen
- Other
- Don’t know

**Sauce?**
- No sauce
- Cheese sauce
- Cream sauce
- Mushroom sauce
- Other sauce
- Unknown sauce
- Don’t know
Was any kind of fat or oil used in cooking or preparing the green beans?

*Please click an option.*
Did you **add** anything to the food?

*Please click an option.*
How much of the green beans did you actually eat?

Please click an option.
How much of the green beans did you actually eat?

Please click an option.

1/2 cup
Here are the details of what you have selected.

If this is correct, click the NEXT button to continue.
Design and Design Development

Next Steps

• Refine vertical tree design
  – Initial working prototype
  – Conduct cognitive testing

• Determine optimal use of food photography

• Expected completion: Summer 2007
Validation

• Planning stages only
• Comparison to AMPM
• Include observation of meals consumed
• Pilot ASA24 in an ongoing cohort study