

From Personal Data to Action: Making Personal Informatics Work

Sean Munson · smunson.com · [@smunson](https://twitter.com/smunson)

slides: <http://smunson.com/talks/hcde521a16/smunson-hcde521a16.pptx>



HUMAN CENTERED DESIGN & ENGINEERING
UNIVERSITY *of* WASHINGTON





slides: <http://smunson.com/talks/hcde521a16/smunson-hcde521a16.pptx>





1760

160

YARDS

ABERCROMBIE & FITCH CO
NEW YORK

320

1440

100 90
MILES

MILES

20

1

50

2

40

3

50

4

60

5

1280

6

1120

480

960

640

MADE IN FRANCE

480



Manpokei 万歩計

MANPO-METER

◎ 日本万歩クラブ推薦



交通巡査
11260歩=6.7^キ(8時間)



さん(20) 東京・有楽町のビヤホール
客席は約五百 大体二十人前後でサービスに当る
満員になれば ちよと立止る暇もない

ビヤホールのウェイトレス
12550歩=5.5^キ(8時間)



さん(22) 東京—大阪の幹線を二往復 タバコや飲み物のサービスで機内を動き回る 乗客は少なく楽だったという

エアホステス
9000歩=4.1^キ(6時間半)



Bi

OMRON

G-Walking style

10258

Steps

12:03

PM

SET

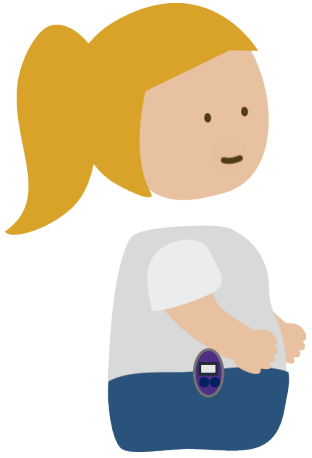
MEMO

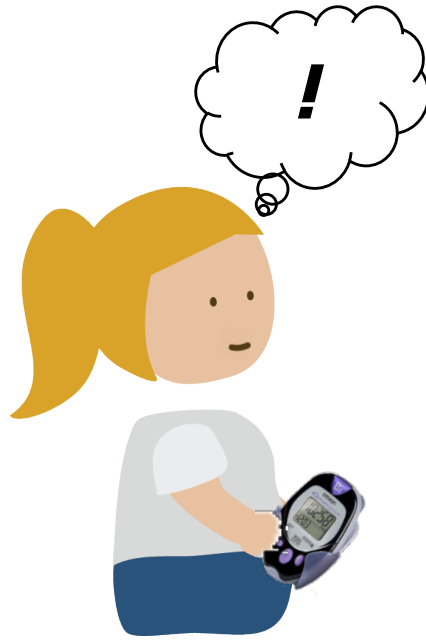
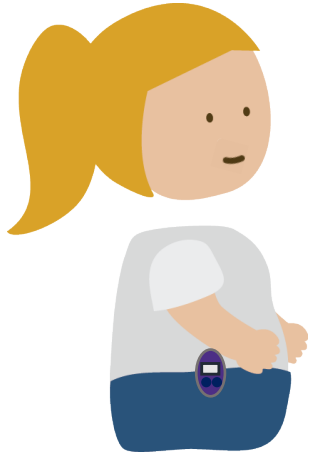
MODE

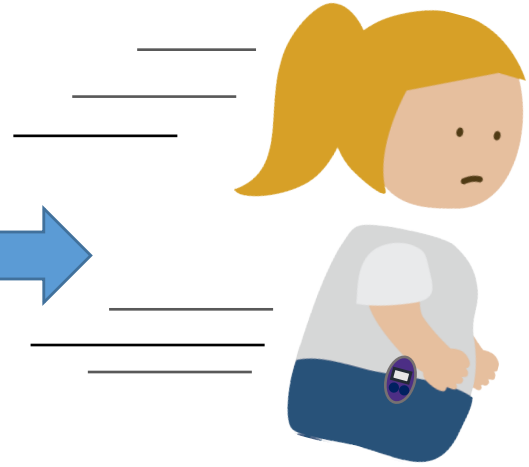
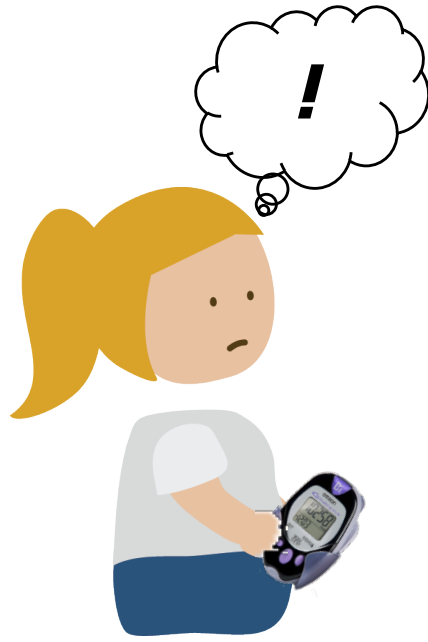
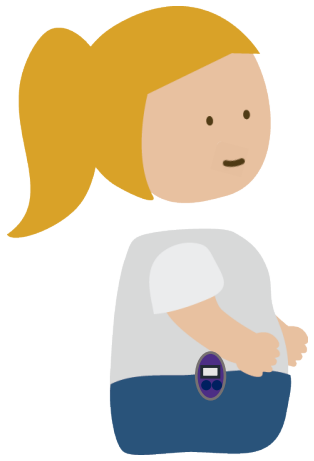
EVENT



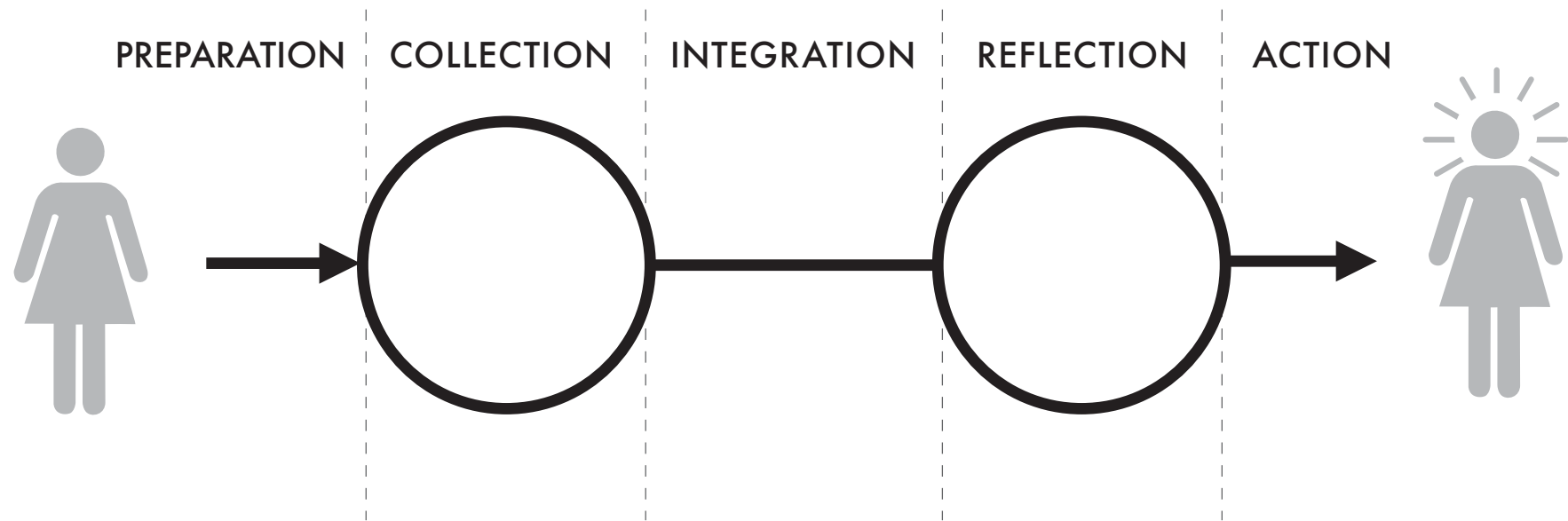
G







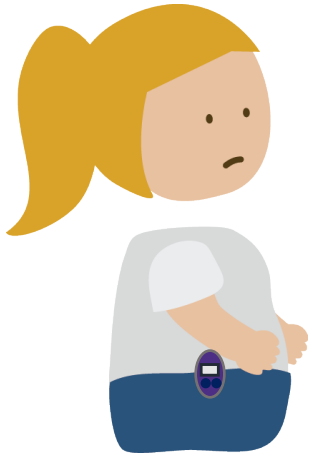
Five-Stage Model of Personal Informatics



Li I., Dey A., Forlizzi J. *CHI 2010*.

"A Stage-Based Model of Personal Informatics Systems"

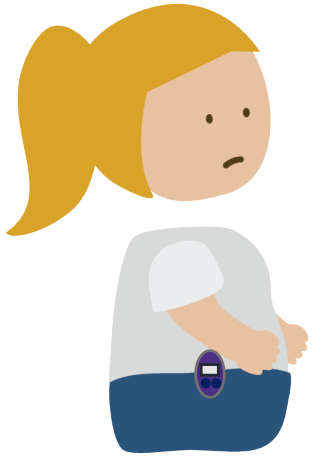
Five-Stage Model of Personal Informatics



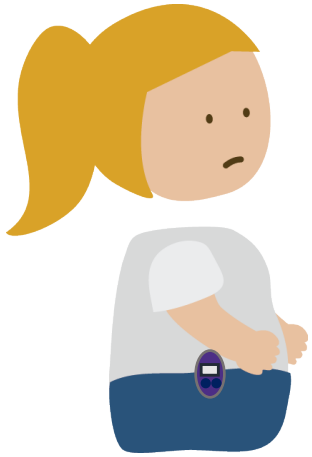
Alice

- 20 years old
- Has a family history of heart disease
- Wants to be more active
- Does not know how, because she is busy

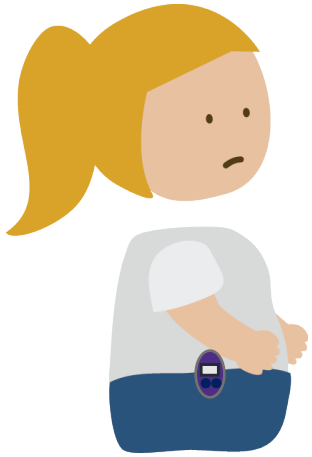
Preparation



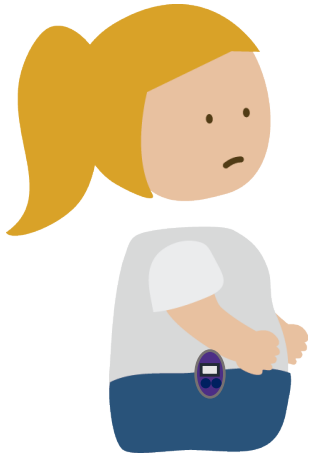
Preparation



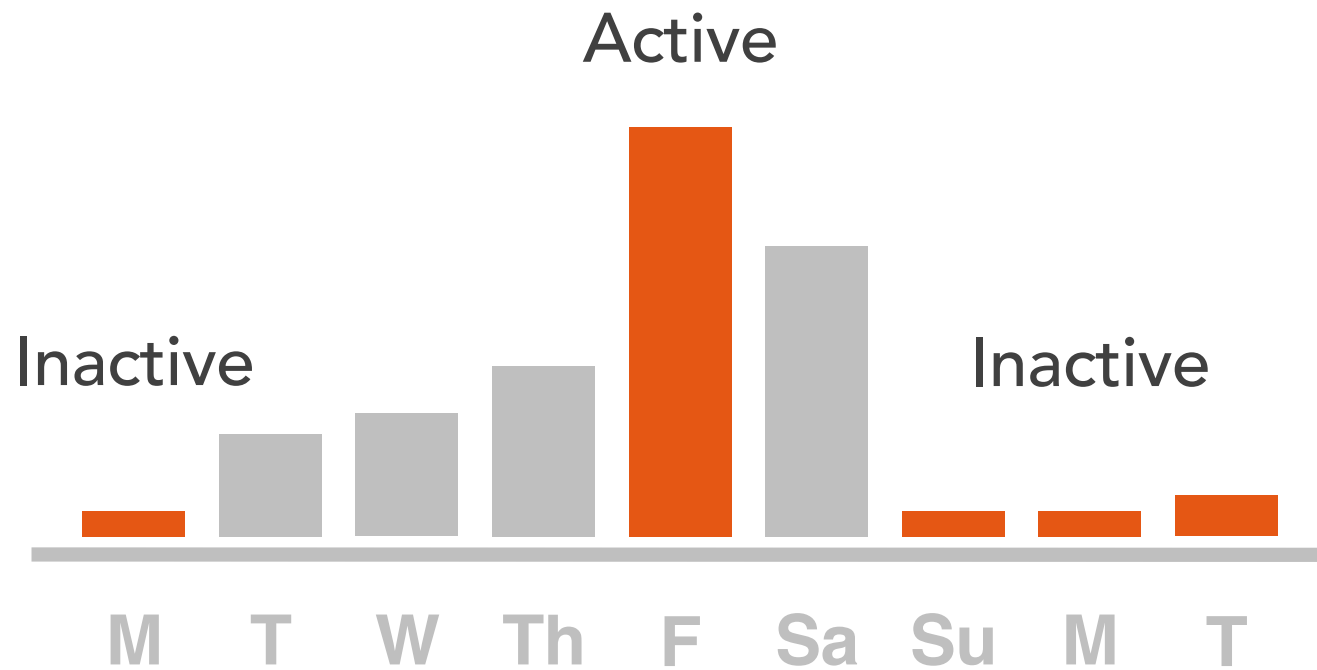
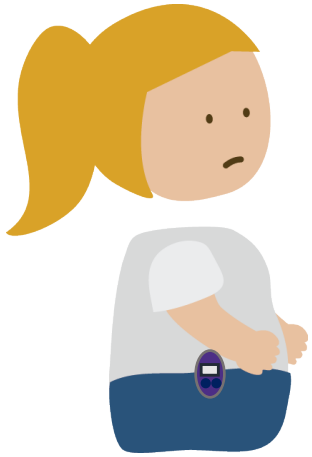
Preparation



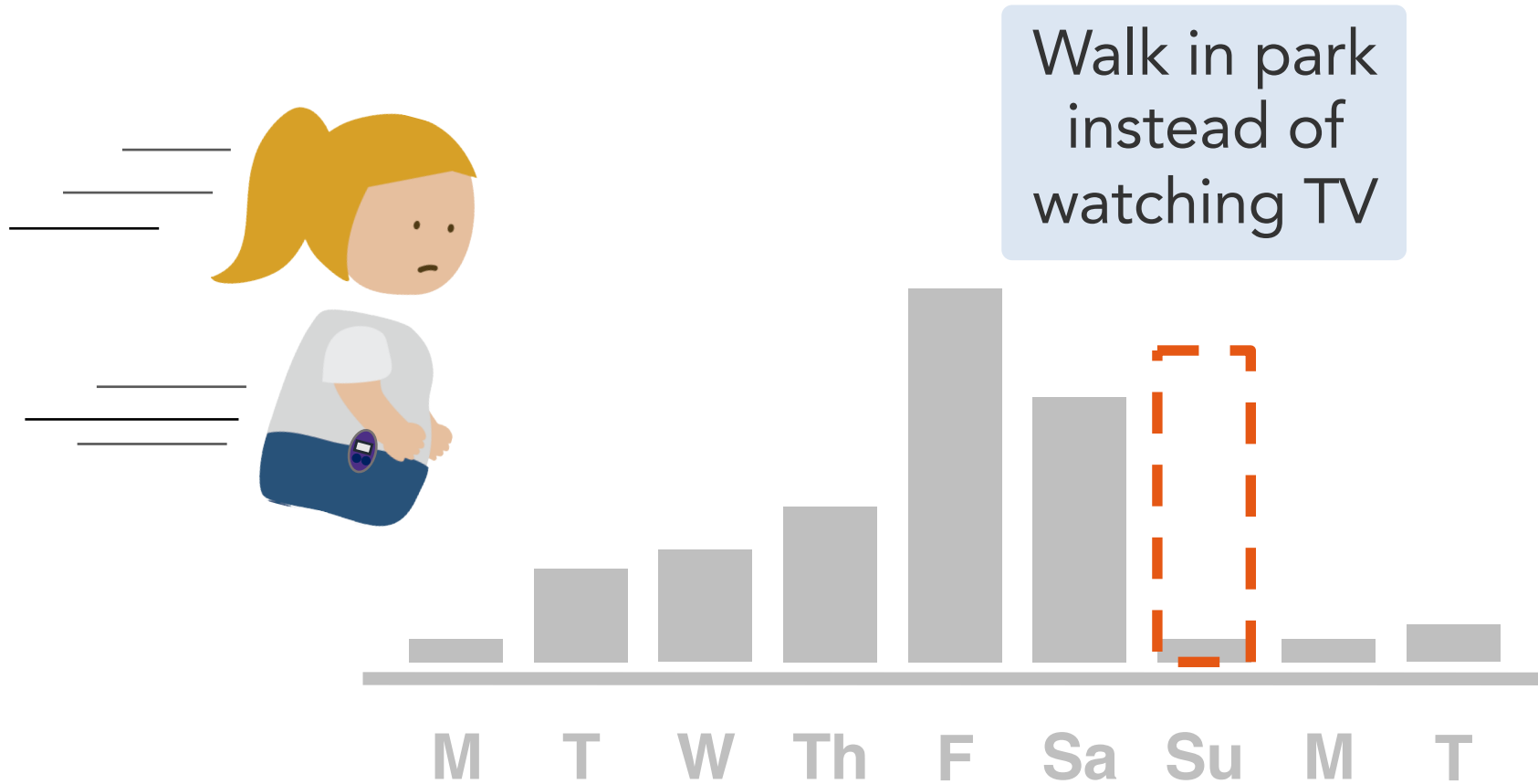
Integration

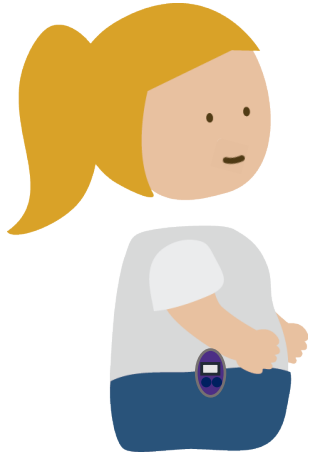


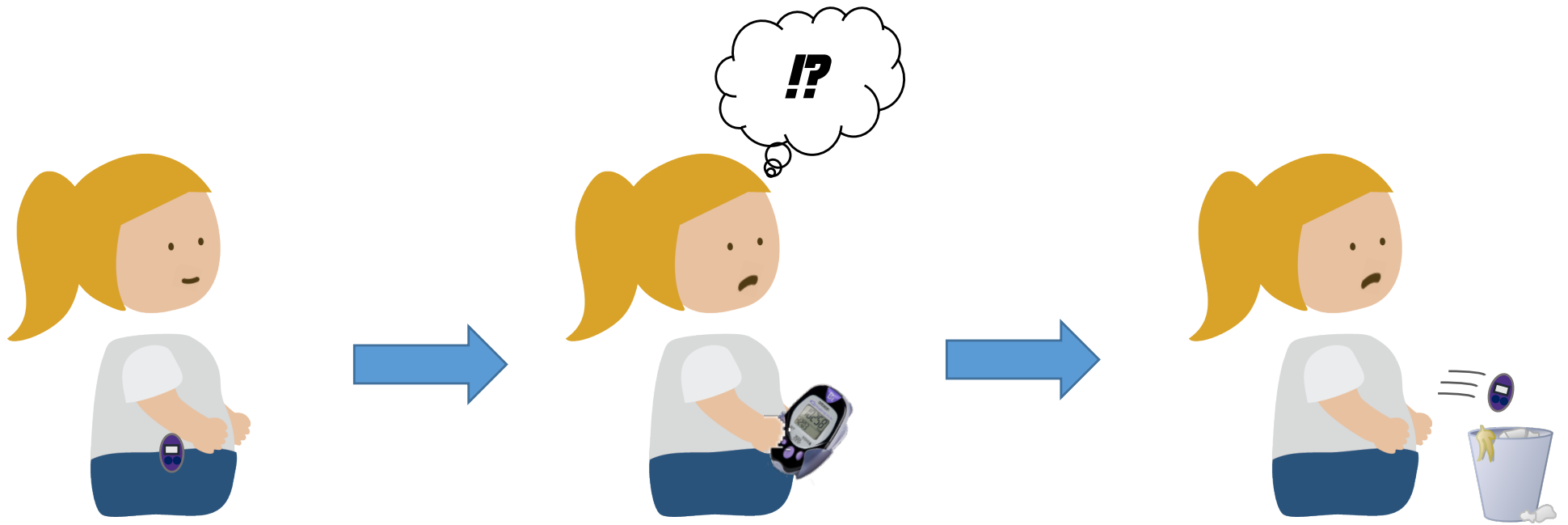
Reflection



Action







Epstein DA, Ping A, Fogarty J, Munson SA. *UbiComp* 2015.
A Lived Informatics Model of Personal Informatics.

Epstein DA, Ping A, Caraway M, Johnston C, Fogarty J, Munson SA. *CHI* 2016.
Beyond Abandonment to Next Steps:
Understanding and Designing for Life after Personal Informatics Tool Use.

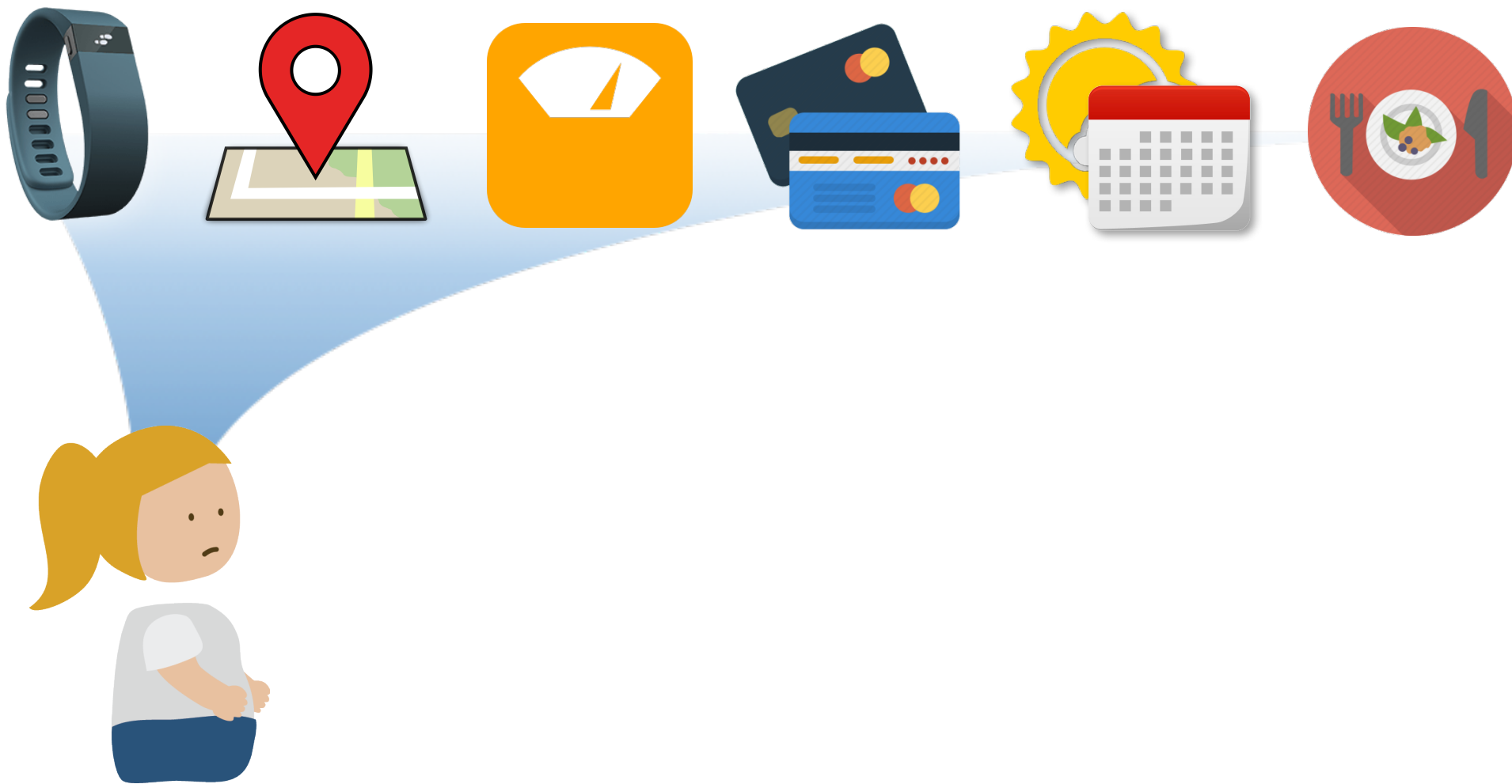






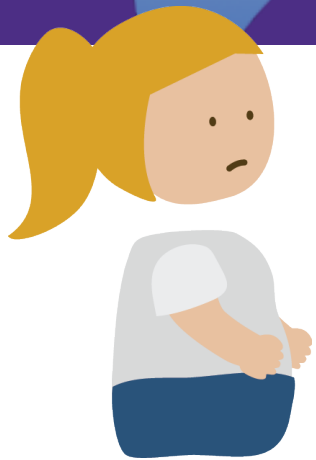
A wealth of information creates a poverty of attention, and a need to allocate that attention efficiently among the overabundance of information sources that might consume it.

- Herbert Simon

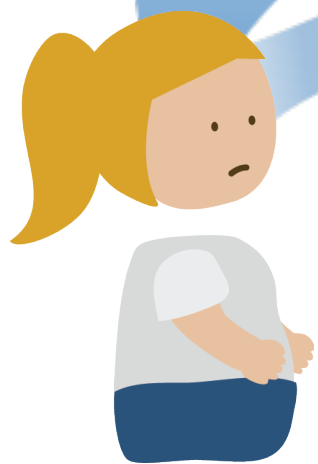




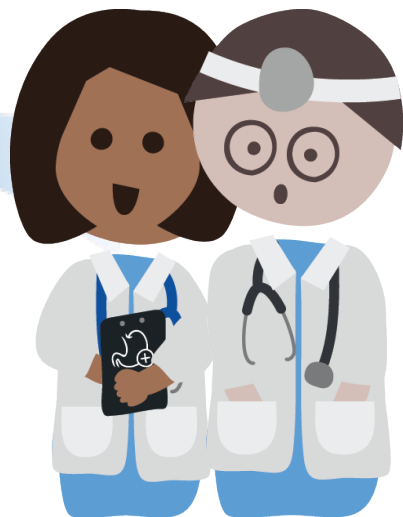
tonight:
working through data together



- ... with experts
- ... with support of friends and family



Individuals



Medical Team

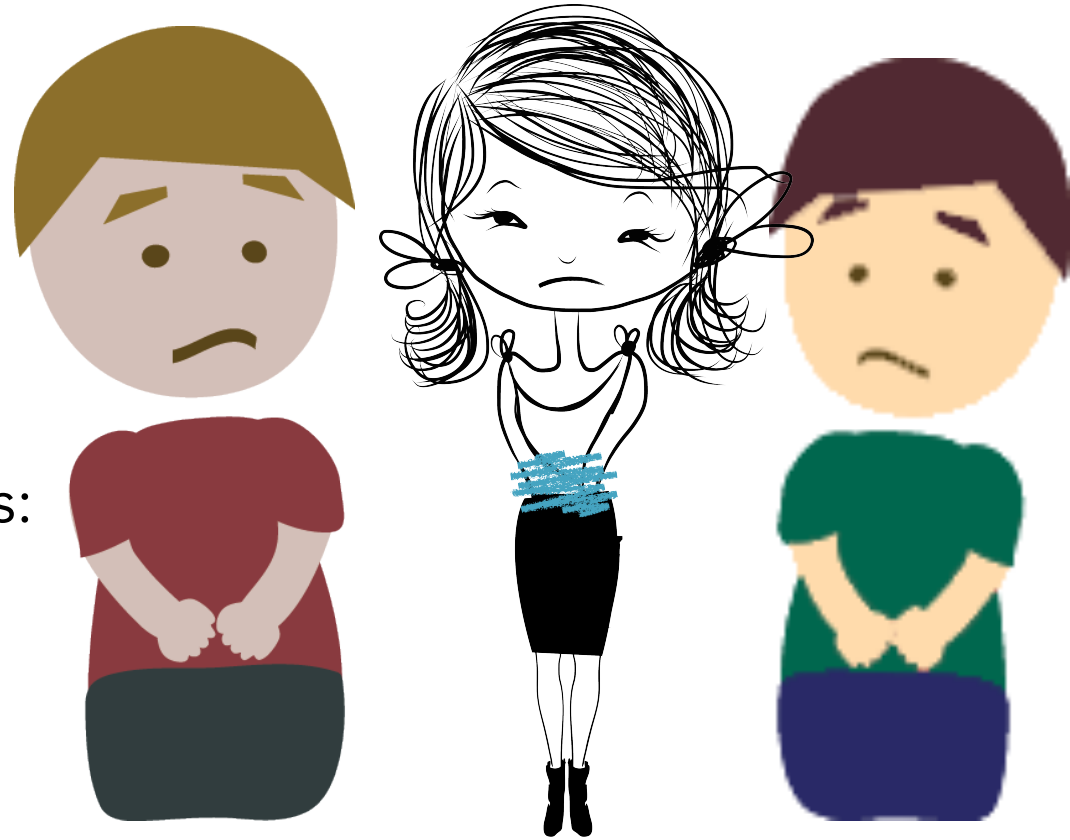
Irritable Bowel Syndrome (IBS)

Characterized by episodic gastrointestinal symptoms.

Affects up to 20% of the US population.

Potential **individualized** triggers:

- certain nutrients
- eating behaviors
- stress
- sleep disturbances
- menstruation



John

Jane

Joe



Pain management



Gastroenterologist



Primary care

How do patients
& providers
collaborate
during the
tracking process?

How do patients & providers collaborate during the tracking process?

Patient Survey

211 overweight & IBS patients

Patient Interviews

18 patients who had experience sharing data with providers

Provider Interviews

21 providers working with IBS and overweight patients

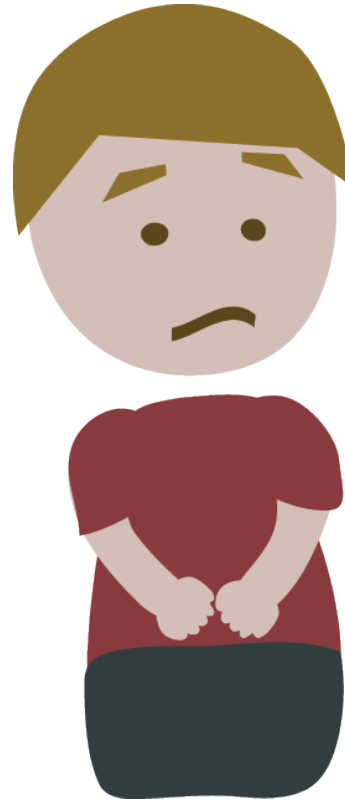
C Chung, K Dew, A Cole, J Zia, J Fogarty, JA Kientz, SA Munson. *CSCW 2016*.

Boundary Negotiating Artifacts in Personal Informatics: Patient-Provider Collaboration with Patient-Generated Data

C Chung, J Cook, E Bales, J Zia, SA Munson. *Journal of Medical Internet Research 2015*.

More Than Telemonitoring: Health Provider Use and Nonuse of Life-Log Data in Irritable Bowel Syndrome and Weight Management

How do patients
& providers
collaborate
during the
tracking process?



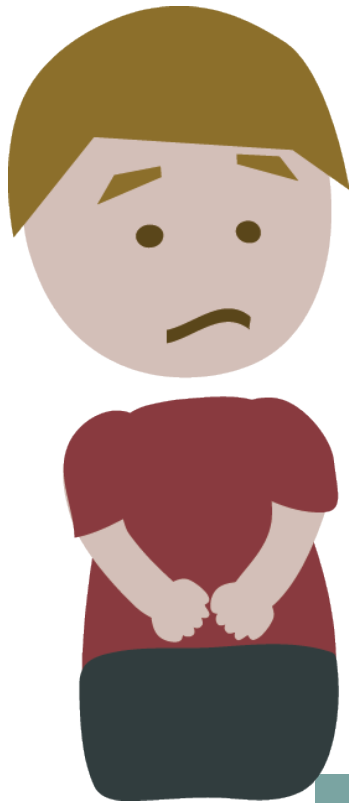
John



Jane



Joe



John

34 years old

Overweight

Irritable Bowel Syndrome (IBS)

Abdominal pain associated with diarrhea and/or constipation

John

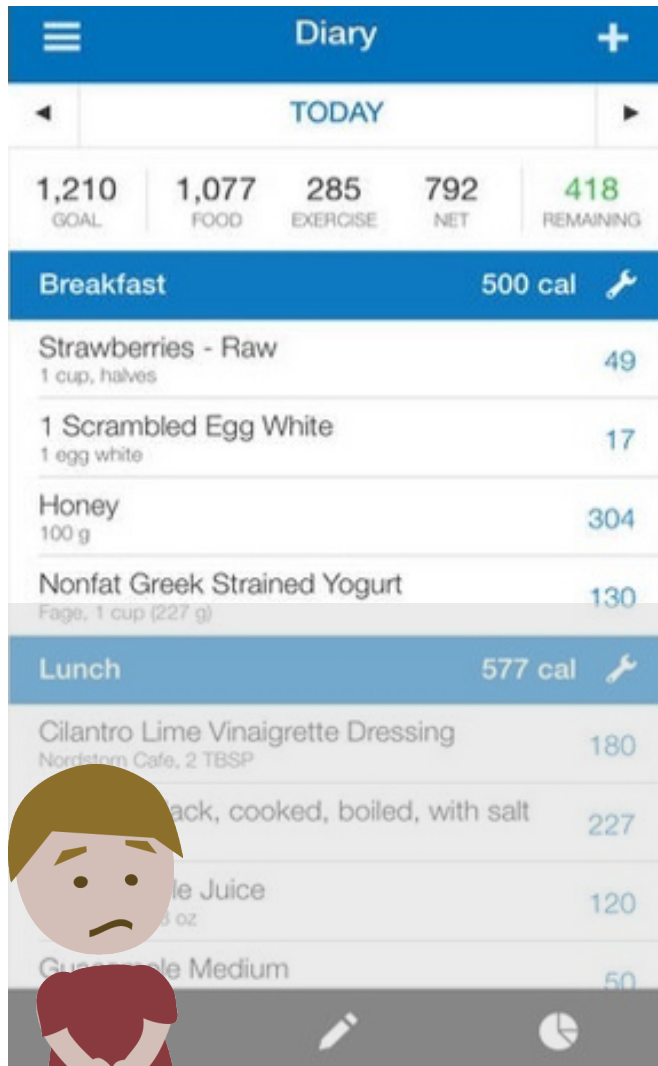
Preparation

Collection

Integration

Reflection

Action



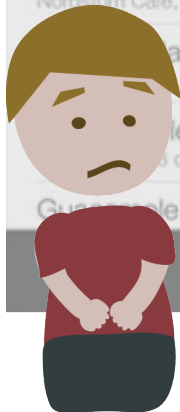
Begins keeping food and symptom diary

John's goal

Provide evidence that he was not responding to the treatment

Support for diagnosis and treatment

Support for affection needs



Preparation

Collection

Integration

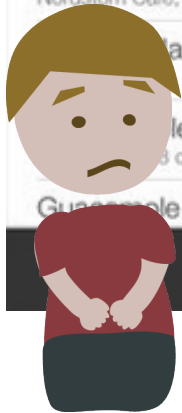
Reflection

Action

Diary				
TODAY				
1,210	1,077	285	792	418
GOAL	FOOD	EXERCISE	NET	REMAINING
Breakfast				500 cal
Strawberries - Raw				49
1 cup, halves				
1 Scrambled Egg White				17
1 egg white				
Honey				304
100 g				
Nonfat Greek Strained Yogurt				130
Fage, 1 cup (227 g)				
Lunch				577 cal
Cilantro Lime Vinaigrette Dressing				180
Nordstrom Cafe, 2 TBSP				
Black, cooked, boiled, with salt				227
Apple Juice				120
3 oz				
Grapefruit Medium				50

John was motivated because he expected provider review

Increase motivation & accountability



Preparation

Collection

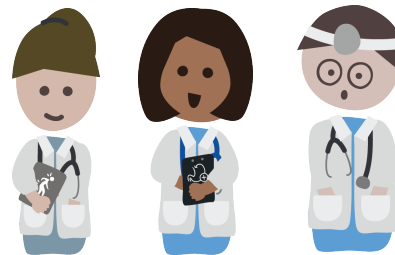
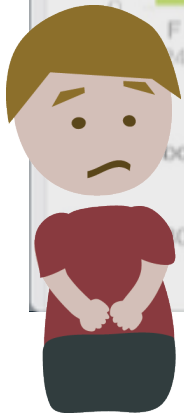
Integration

Reflection

Action

John integrated data using his app and expected it to help his providers

Limitation of tools
Difficulty anticipating provider use



Preparation

Collection

Integration

Reflection

Action

John and his providers tried to make sense of the data together

25% visit time
(< 5 mins / 20-min visit)

6/21 - after large coffee - caffeine - MSG
Fructose (oligosaccharide),
fat

dinner lunch - fat/sweets

bread - fructose

salads - fructose

tea
? caffeine?

dinner - no MSG - no fructose

no caffeine

beer - ? gas not much fructose

6/22 -

- less solid (fructose) - symptoms

- low lactose

- low fat

4:25 - smarties - sl. pain

fructose

dinner - low lactose

low fructose

also - xy -

good!

- lactose
- good
- low fructose

on migration



Preparation

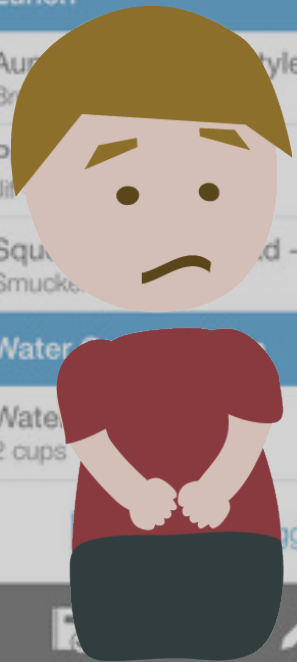
Collection

Integration

Reflection

Action

I'm working very hard. This should be helpful. My doctors can probably help me figure out what to do.



Diary					Diary					Diary				
TODAY					TUE Nov 19, 2013					TODAY				
1,210	+490	-0	490	720	1,800	1,753	240	1,513	287	1,210	1,077	285	792	418
GOAL										FOOD	EXERCISE	NET	REMAINING	
Breakfast					1 serving(s)					Lunch				
Greek 100% Yoplait, 1 container					Wine					Honey				
180					Red Table Wine, 5 oz					100 g				
190					Snacks					Nonfat Greek Strained Yogurt				
20					Aged White Cheddar Puffs					Fage, 1 cup (227 g)				
Water					Cardio Exercise					Lunch				
-					240 cal					577 cal				
-					Fitbit calorie adjustment					Cilantro Lime Vinaigrette Dressing				
-					6,996 Steps					Nordstrom Cafe, 2 TBSP				
-					Finished logging for today					Beans - Black, cooked, boiled, with salt				
-					-					1 cup				
-					-					100% Apple Juice				
-					-					Old Orchard, 8 oz				
-					-					Guacamole Medium				
-					-					50				

Diary +

TODAY

1,210 GOAL | +490 FOOD | -0 EXERCISE | 490 NET | 720 REMAINING

Breakfast 100 cal

Greek 100 Calories Blended Strawbe... 100

Aunt Millie's Homestyle 100% Whole... Bread, 2 slice (34 g) 180

Peanut Butter 16oz Jif - Creamy, 2 tbsp 190

Squeeze Fruit Spread Smuckers, 1 Tbsp 20

Water Consumption

Water 2 cups -

Finished logging

Diary +

TUE | Nov 19, 2013

1,800 GOAL | 1,753 FOOD | 240 EXERCISE | 1,513 NET | 287 REMAINING

Dinner 514 cal

Briney Caesar Salad Dressing 1 serving(s)

Quinoa Casar Salad

Wine Red Table Wine, 5 oz

Snacks 260 cal

Aged White Cheddar Pirate's Booty, 2 oz 260

Cardio Exercise 240 cal

Fitbit calorie added 6,996 Steps 240

Finished logging for the day

Diary +

TODAY

1,210 GOAL | 1,077 FOOD | 285 EXERCISE | 792 NET | 418 REMAINING

Breakfast 500 cal

1 Scrambled Egg White 17

Honey 100 g 304

Nonfat Greek Strained Y... Fage, 1 cup (227 g) 130

Lunch 577 cal

Cilantro Lime Vinaigrette Nordstrom Cafe, 2 TBSP 180

Beans - Black, cooked with salt 1 cup 227

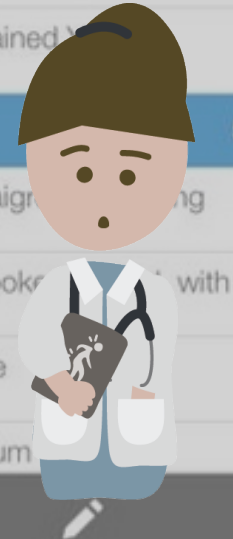
100% Apple Juice Old Orchard, 8 oz 120

Guacamole Medium 50

I don't have time for this!

I'm not trained for this!

How do I deal with that many data?



Introducing the FODMAPs

The nature of each type of FODMAP and which foods contain them is outlined below. On pages 44–45, we'll tell you which foods contain a small enough amount of FODMAPs overall to be suitable on the low-FODMAP diet, and on pages 46–47 we'll explain how to test your tolerance for each category of FODMAP.

OLIGOSACCHARIDES

The major types of oligosaccharides found in food that are FODMAPs are fructans and galacto-oligosaccharides (GOS).

Fructans

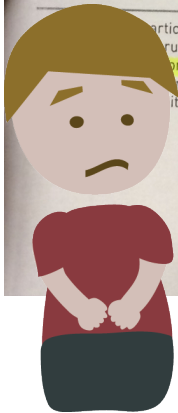
Fructans are chains of fructose molecules with a glucose molecule at the end. The main dietary

sources of fructans include wheat products (breads, cereals, and pasta) and some vegetables, such as onions. Additional sources of fructans are fructo-oligosaccharides (also called oligofructose and FOS) and inulins, which are added to some foods, such as certain yogurts and milk, as a prebiotic (see page 21).

No one is able to digest fructans, and if you have IBS you should minimize your intake of them. Fructans are probably the most common FODMAP to cause symptoms of IBS, probably because most people eat a lot of them. They occur in a wide variety of foods and in large amounts in our food supply.

Foods are considered a problem for sufferers of IBS if they contain more than 0.2 gram of fructans per serving of food for cereals and grains, and 0.3 gram of fructans per serving of food for other foods. The main food sources of fructans are some vegetables and grains, as well as a small number of nuts and fruits.

	HIGH-FRUCTAN FOODS (not suitable)	MODERATE-FRUCTAN FOODS (suitable up to amounts given in parentheses)	LOW-FRUCTAN FOODS (suitable)
FRUITS	nectarines, persimmon, tamarillo, watermelon, white peaches	pomegranate (seeds from ½ small, rambutan (3 whole)	all others
	artichokes (globe and Jerusalem), garlic, leeks, onions (yellow, red, white, onion powder), scallions (white part), shallots	asparagus (3 spears), beet (½ medium), broc- coli (½ cup), Brussels sprouts (½ cup), butternut squash (¼ cup), savoy cabbage (1 cup), fennel (½ cup), green peas (½ cup), snow peas (10 pods), sweet corn (½ cob)	alfalfa sprouts, avocados, bamboo shoots, bean shoots, bok choy, bell peppers, carrots, cauliflower, celery, Chinese cabbage, chives, cucumber, eggplant, endive, ginger, green beans, lettuce, mushrooms, olives, parsnips, potatoes, pumpkin, Swiss chard, spinach,



John's provider gave him instructions for new diet and tracking plan

Incorporating instructions into tracking process is difficult

Not confident that the recommendations are correct

Preparation

Collection

Integration

Reflection

Action



Severe Symptoms

Missing Work

Needs Help

Preparation

Collection

Integration

Reflection

Action

Jane



unsure what to do

Consults Brother

Had Similar Symptoms

Shares his Triggers

Stress & Exercise

Preparation

Collection

Integration

Reflection

Action



tracks stress & physical activity

Buys a Fitness Band

Tracks Mood

Tracks Physical Activity

Preparation

Collection

Integration

Reflection

Action



(tries to) make sense of the data

Lots of Data
Mood Over Time
Activity Over Time

But No Understanding

Preparation

Collection

Integration

Reflection

Action



maybe her doctor
can help?

Did not Track Symptoms

Did not Track Food

Elimination Diet

Difficult to Follow

Difficult to Interpret

Lengthy Process

Possibly Inconclusive

Preparation

Collection

Integration

Reflection

Action

current standard of care

Some FODMAPs
Not watery, loose
tolerable" does own looking

Stanford Hospital and Clinics
Digestive Health
Food/GI Symptoms Record

Instructions: Please record everything you eat and drink (including ice and water taken with your medications). Circle your symptoms if any as they occur after meals and snacks.

Date:	Food & Beverages and Amount	Symptoms if any (circle).
6/22	<p>Breakfast Time: 1 1/4 c oatmeal w/ 2 Tr rice milk 1/2 Tr. Tosts wheat free waffle 100% peppermint tea</p> <p>Snack Time: 11:00 - 1 slice french toast egg white, milk</p> <p>Lunch Time: 12:30 3oz fresh cold broiled salmon 4oz cranberry juice 5 flour tortilla, toasted - avacado, olives 1/2 lemon, low fat dressing - warm rice 1T. 1/2 ginger cookie whole foods</p> <p>Snack Time: 3:00 rice crispies, rice milk, blueberries</p> <p>Dinner Time: 6:00 1c. chicken broth 1 Tr. rice 4oz organic broiled chicken breast Baked sweet yam, steamed carrots, zucchini, cranberry sauce, tea, raspberry sorbet, homemade cake</p> <p>Snack Time: 8:30 crackers, reduced sugar jam</p>	<p>Nausea Vomiting Heartburn Stomach Pain Diarrhea Constipation Sense of Urgency Gas Bloating Cramping Other: before breakfast</p> <p>Nausea Vomiting Heartburn Stomach Pain Diarrhea Constipation Sense of Urgency Gas Bloating Cramping Other: after dinner</p>
6/25	<p>Breakfast Time: 9:30 1 1/4 c oatmeal w/ Tr rice cereal, 1 Tr rice milk - CA enriched - Tradents wheat free waffle, maple syrup 1T. Peppermint tea</p> <p>Snack Time: 11:00 1/2 c Soy Yogurt, fr blueberries, mashed strawberries (yellow) cracker</p> <p>Lunch Time: 1:00 Toast. 3oz Roast Turkey Breast 1/4 avacado, mustard, romaine hard boiled egg white, 5 Baked potato chips - tea, 2oz cranb juice</p> <p>Snack Time: 4:00 pretzels, 1/2t peanut butter, crackers</p> <p>Dinner Time: 6:30 Flour tortilla - 4oz Tilapia pan seared, lemon, olive oil, couscous Israeli, green beans fresh, carrots + peas, apple sauce 1/4 cup, blueberries</p> <p>Snack Time: 1/2 ginger cookie raspberry sorbet, small piece yellow cake (f. baked)</p>	<p>Nausea Vomiting Heartburn Stomach Pain Diarrhea Constipation Sense of Urgency Gas Bloating Cramping Other:</p> <p>Nausea Vomiting Heartburn Stomach Pain Diarrhea Constipation Sense of Urgency Gas Bloating Cramping Other:</p>

Bedtime - water 600mg gabapentin - every night
align probiotic - 4-6 times a week after lunch

P:\Food Diary.doc

5/21/12 - Woke at 6:30
- BM at 6:32
(low back ache)
(wake with low back ache through the night)
- BM at 7:10
- Breakfast at 8:00
- SNACK AT 9:30
- SNACK AT 11:15
- SNACK AT 1:45
(all symptoms passed)
- SNACK AT 3:00
- DINNER AT 5:30

5/22/12 - Awoke at 12:30
(low back pain, abdominal cramps,
right knee ache, right foot tingling, gas,
mild nausea)
- SNACK AT 2:00
- Woke at 6:30
- BM AT 6:35
- BM AT 6:40
- BM AT 6:50
- BM AT 7:30
- Breakfast at 8:00
(still have low back pain)

- TOOK SYNTHROID
- TOOK M.V.
- 2 EGGS POACHED
- WATER
- 3 MEDJOL DATES W/
NATURAL PEANUT BUTTER
- KEFIR
- HAND FULL OF SESAME STICKS
- WATER
- APRICOT
- 3 MEDJOL DATES W/
NATURAL PEANUT BUTTER
- HANDFUL OF MIXED NUTS
- LASAGNA W/ ARTICHOKE & AVOCADO
- 1 SPOON APPLE CHEW
- WATER

- KEFIR
- BROWN RICE CRISPS
- RICE MILK
- HALF BANANA
- KEFIR
- 2 MEDJOL DATES W/
NATURAL PEANUT BUTTER
- BM AT 10:45

WORKDAY;
NOVE STORE

inconsistent results

- Study: show same patient diaries to different providers
- Same patient, different providers: completely different recommendations
- Same provider, different patient: same recommendations

Some FODMAPs
 does own looking
 Not watery, loose

Name: Brent Fisher
 "tolerable"

Stanford Hospital and Clinics
 Digestive Health
 Food/GI Symptoms Record

Instructions: Please record everything you eat and drink (including ice and water taken with your medications). Circle your symptoms if any as they occur after meals and snacks.

Date:	Food & Beverages and Amount	Symptoms if any (circle).
4/22	Breakfast Time: 1/4 c oatmeal w/ 1/2 true milk 1/2 c. Raisin Bran - 1/4 c sugar 1/2 Tr. Tosts wheat free waffle 100z. Peppermint tea water, tea Snack Time: 11:00 - 1 slice french toast egg white, milk Lunch Time: 12:30 3 oz fresh cold broiled salmon 4oz blueberry juice 1/2 flour tortilla, toasted - avocado, olives 1/2 lemon, low fat dressing - warm rice 1T. 1/2 c. fresh organic whole breads Snack Time: 2:00 Rice Crisps, rice milk, blueberries Dinner Time: 6:00 1c chicken broth 1 Trice 4oz organic broiled chicken breast Baked sweet yam, steamed carrots, Zucchini, cranberry sauce, tea, raspberry sorbet, homemade cake Snack Time: 8:30 crackers, reduced sugar jam	Nausea Vomiting Heartburn Stomach Pain Diarrhea Constipation Sense of Urgency Gas Bloating Cramping Other: before breakfast
6/25	Breakfast Time: 1/4 c oatmeal w/ Trice cereal, 2 Trice milk - CA enriched - Tridents wheat free waffle, maple syrup 1c. Peppermint tea Snack Time: 11:00 1/4 c Soy Yogurt - 1/2 blueberries 1/2 c. raisin bran (1/2 c. yellow) crackers Lunch Time: 1:00 Toast - 3oz Roast Turkey Breast 1/4 avocado, mustard, romaine hard boiled egg white, baked potato chips - tea, 2oz cranberry Snack Time: 4:00 pretzels, 1/2t peanut butter, crackers Dinner Time: 6:30 Flour Tortilla - 4oz Tilapia pan Seared, lemon, olive oil, avocado Israeli, green beans fresh, carrots + peas, apple sauce 1/2cup, blueberries 1/2c maple-cookie raspberry sorbet, small rice w/ blueberries	Nausea Vomiting Heartburn Stomach Pain Diarrhea Constipation Sense of Urgency Gas Bloating Cramping Other: after dinner

5/21/12 - WORK AT 6:30
 - BM AT 6:32 (low back ache)
 (wake with low back ache through the night)
 - BM AT 7:10
 - BREAKFAST AT 8:00
 - SNACK AT 9:30
 - SNACK AT 11:15
 - SNACK AT 1:45 (all symptoms passed)
 - SNACK AT 3:00
 - DINNER AT 5:30

- TOOK SYNTHROID
 - TOOK M.V.
 - 2 EGGS POACHED
 - WATER
 - 3 MEDJOL DATES W/ NATURAL PEANUT BUTTER
 - KEFIR
 - HAND FULL OF SESAME STICKS
 - WATER
 - APPLE
 - 3 MEDJOL DATES W/ NATURAL PEANUT BUTTER
 - HANDFUL OF MIXED NUTS
 - ASKAM W/ ARTICHOKE & AVOCADO
 - 1 STICK GUM CHW
 - WATER

5/22/12 - WORK AT 12:30
 (low back pain, abdominal cramps, right knee ache, right foot tingling, gas, mild nausea)
 - SNACK AT 2:00
 - WORK AT 6:30
 - BM AT 6:35
 - BM AT 6:40
 - BM AT 6:50
 - BM AT 7:30
 - BREAKFAST AT 8:00 (still have low back pain)
 - BM AT 10:45

- KEFIR
 - BROWN RICE CRISPS
 - RICE MILK
 - HALF BANANA
 - KEFIR
 - 2 MEDJOL DATES W/ NATURAL PEANUT BUTTER



Joe

Preparation

Collection

Integration

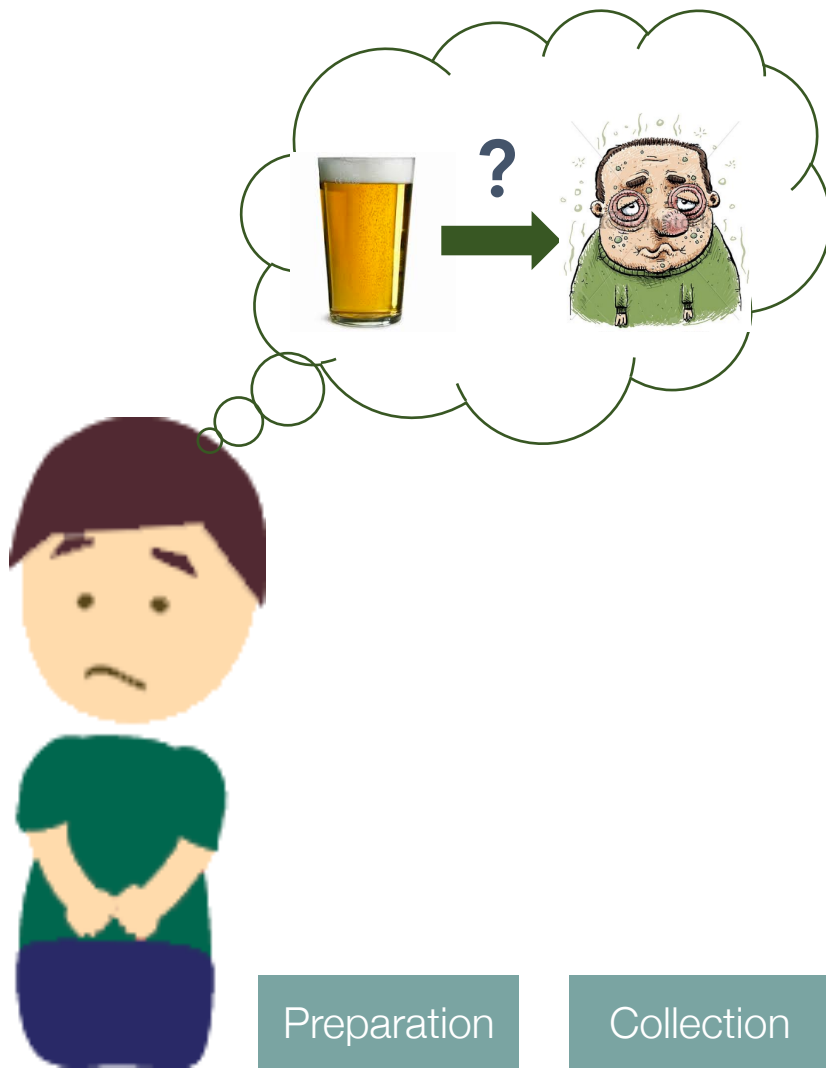
Reflection

Action

Joe

Wonders if alcohol or wheat might be a trigger for his GI symptoms.

Doesn't have a doctor who he feels he can turn to to help him answer this question.



Joe

Preparation

Collection

Integration

Reflection

Action

Joe

Wonders if alcohol or wheat might be a trigger for his GI symptoms.

Doesn't have a doctor who he feels he can turn to to help him answer this question.



+



Decides to conduct an experiment

Wants a conclusive answer fast.

Preparation

Collection

Integration

Reflection

Action



Decides to conduct
an experiment

Sure enough, he gets sick.

But so would anyone.

Preparation

Collection

Integration

Reflection

Action

Providers and patients
collaborate in every tracking stage
and need better support in these collaborations



C Chung, K Dew, A Cole, J Zia, J Fogarty, JA Kientz, SA Munson. *CSCW 2016*.

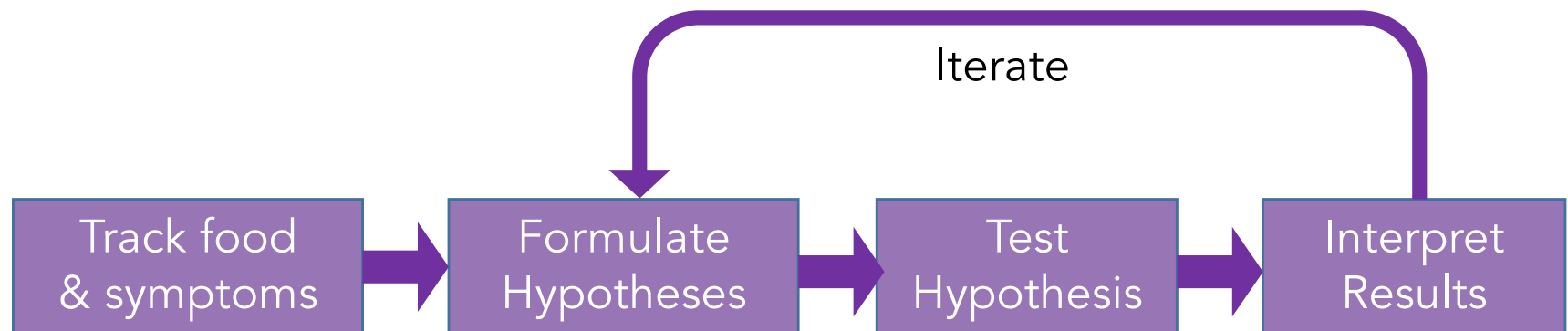
Boundary Negotiating Artifacts in Personal Informatics: Patient-Provider Collaboration with Patient-Generated Data

C Chung, J Cook, E Bales, J Zia, SA Munson. *Journal of Medical Internet Research 2015*.

More Than Telemonitoring: Health Provider Use and Nonuse of Life-Log Data in Irritable Bowel Syndrome and Weight Management

recasting self-tracking

- Hypothesis formation based on journals
- Rethinking trigger detection to rigorously test hypotheses while reducing patient and provider burden.

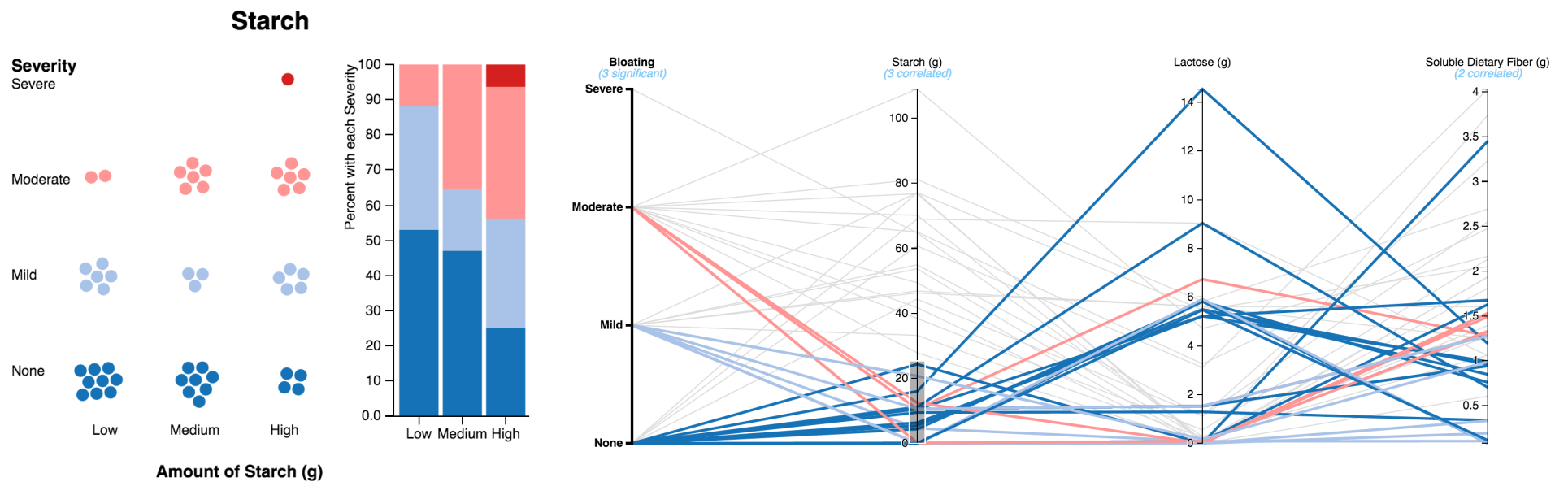


recasting self-tracking

- **Hypothesis formation based on journals**
- Rethinking trigger detection to rigorously test hypotheses while reducing patient and provider burden

a new process

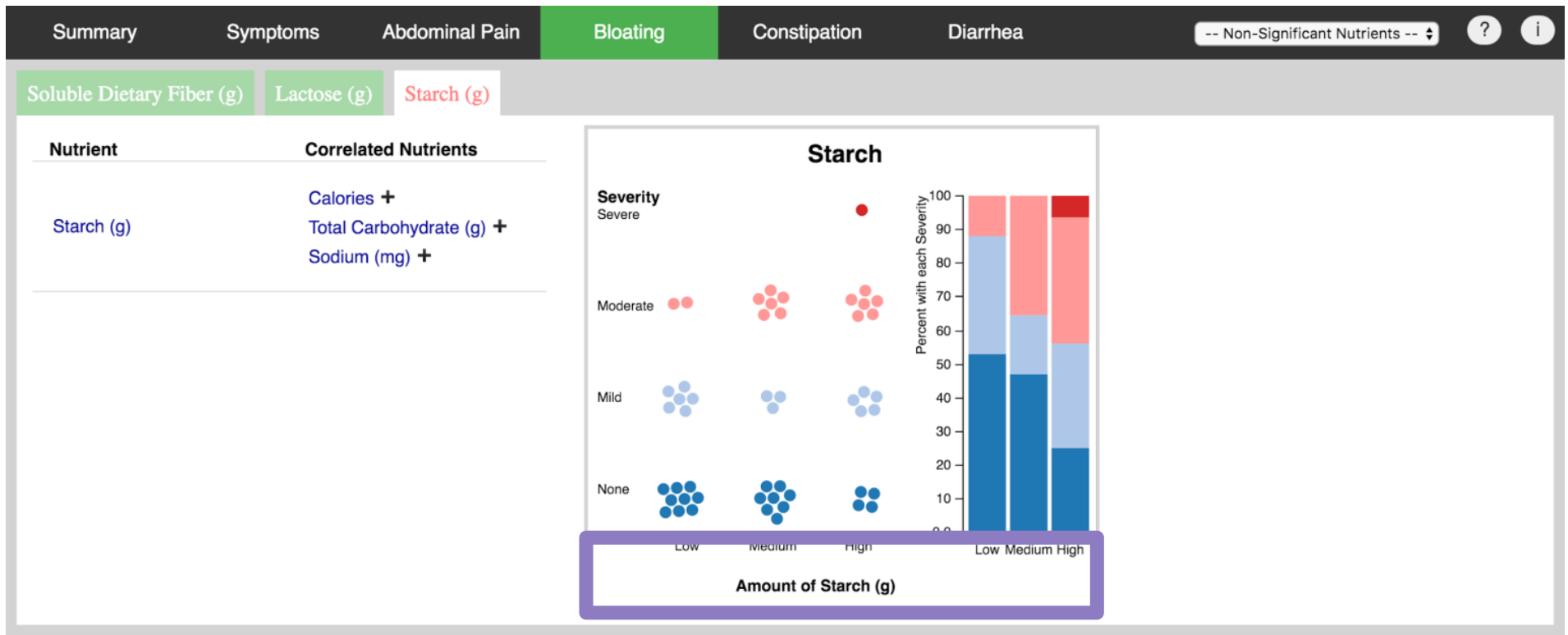
visualizing results



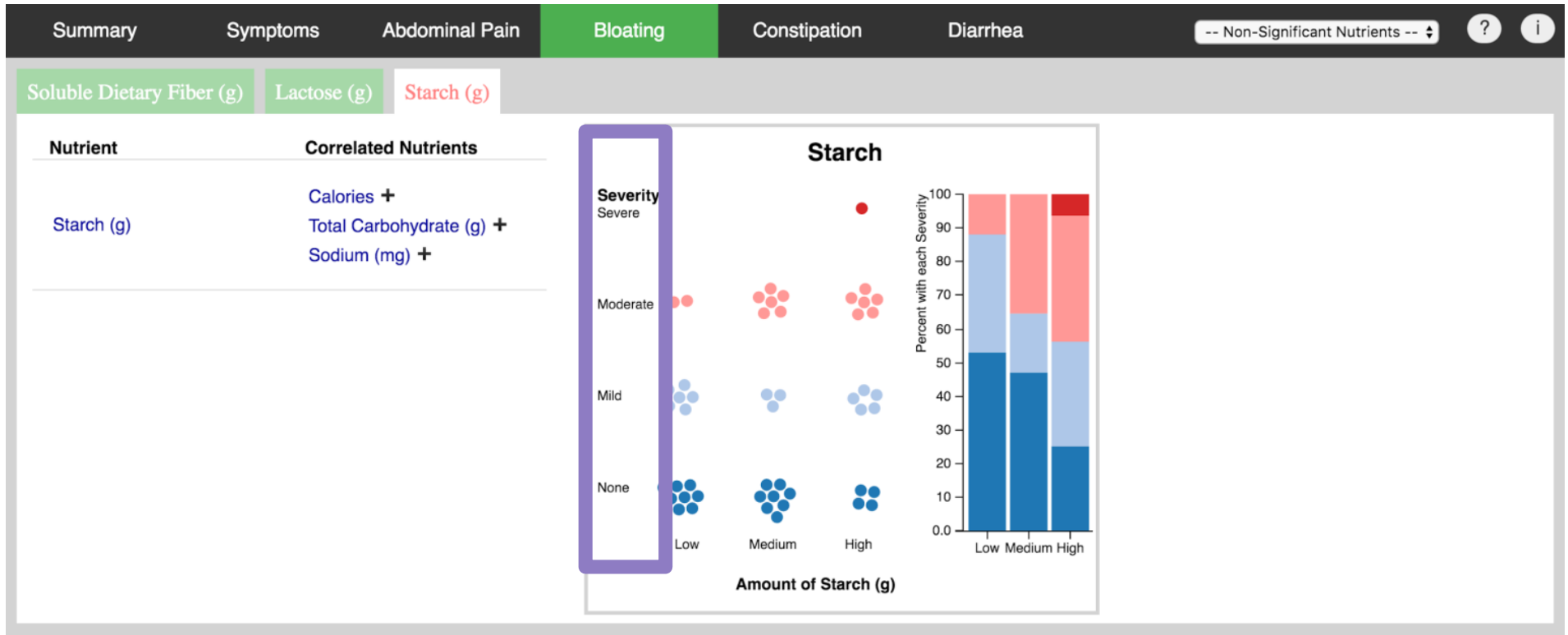
visualizing results: bubble and bar chart



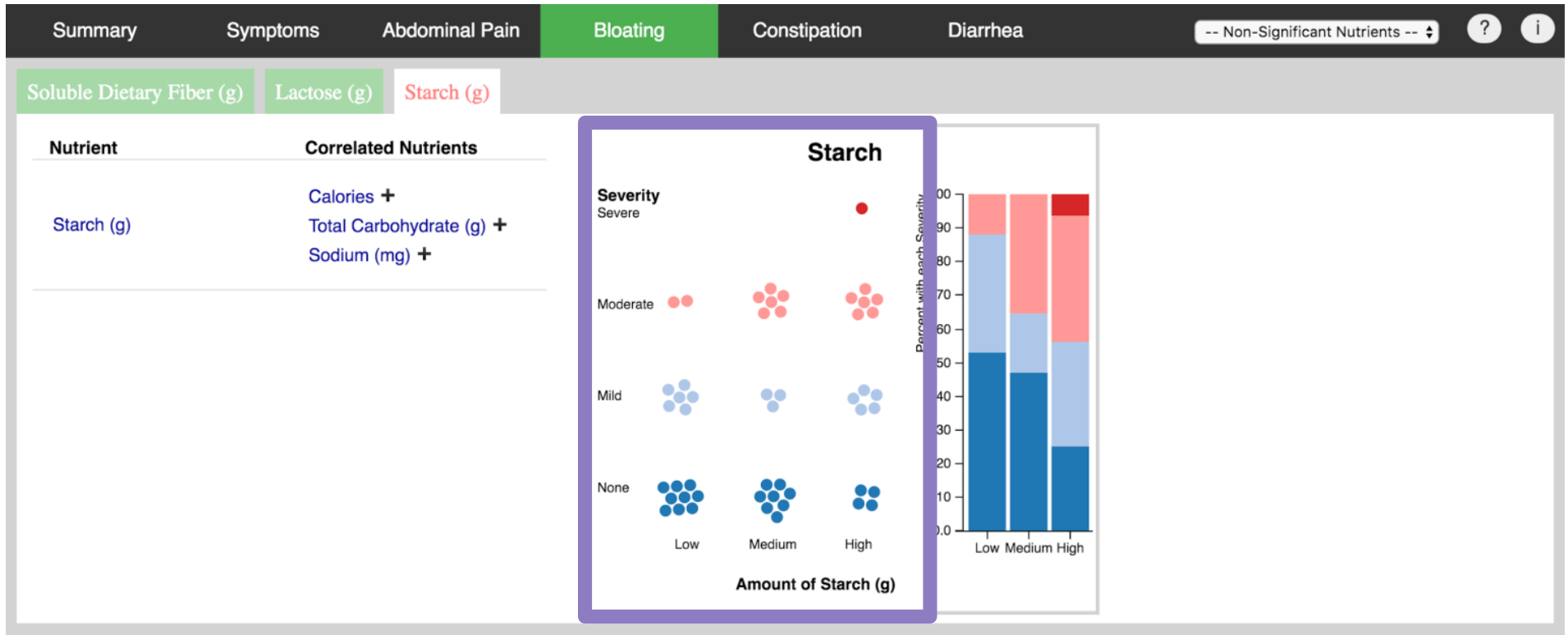
visualizing results: bubble and bar chart



visualizing results: bubble and bar chart



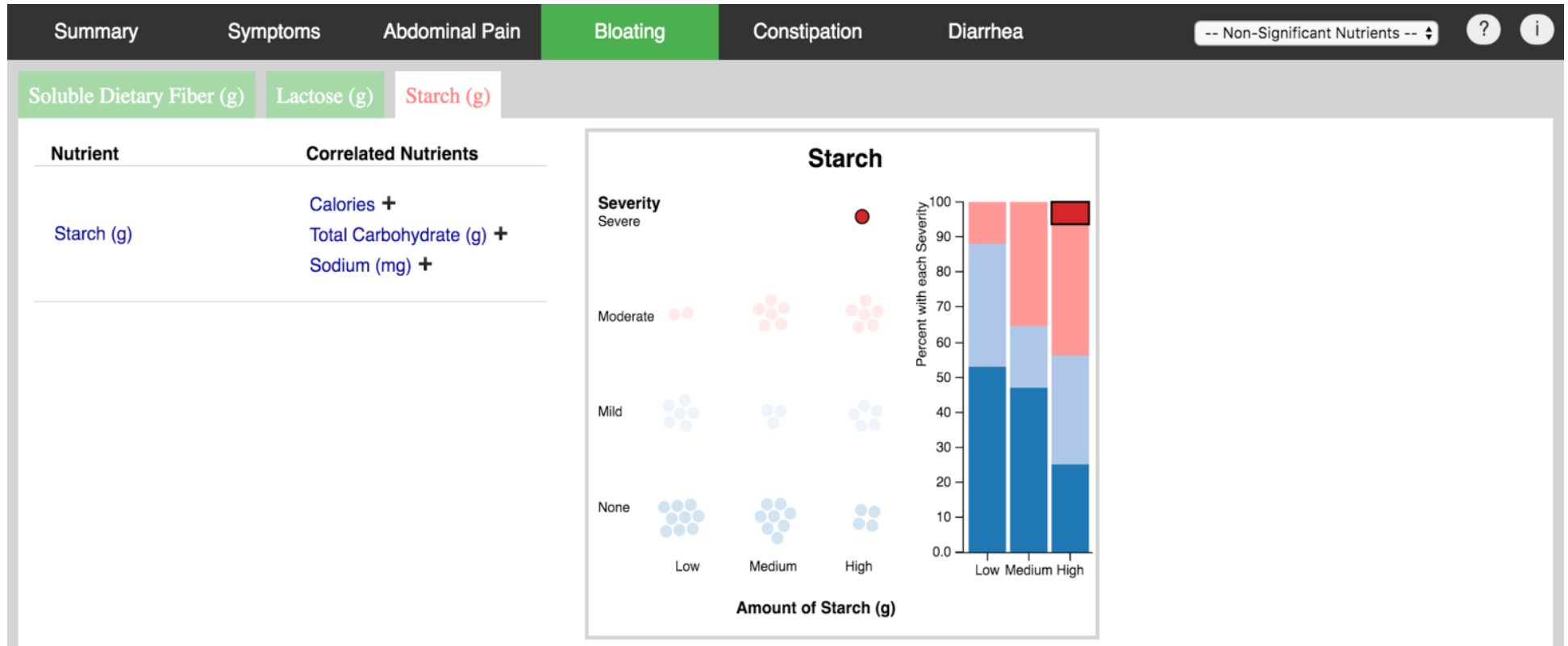
visualizing results: bubble and bar chart



visualizing results: bubble and bar chart



visualizing results: bubble and bar chart



Time of Logged Symptoms

▼ 10/24/14 9:00PM

mandarin slices (3 section)

amy's mexican casserole bowl (1 package)

cheddar cheese (3 oz)

rosemary wafer thins (15 g)

Starch (g)

64.73

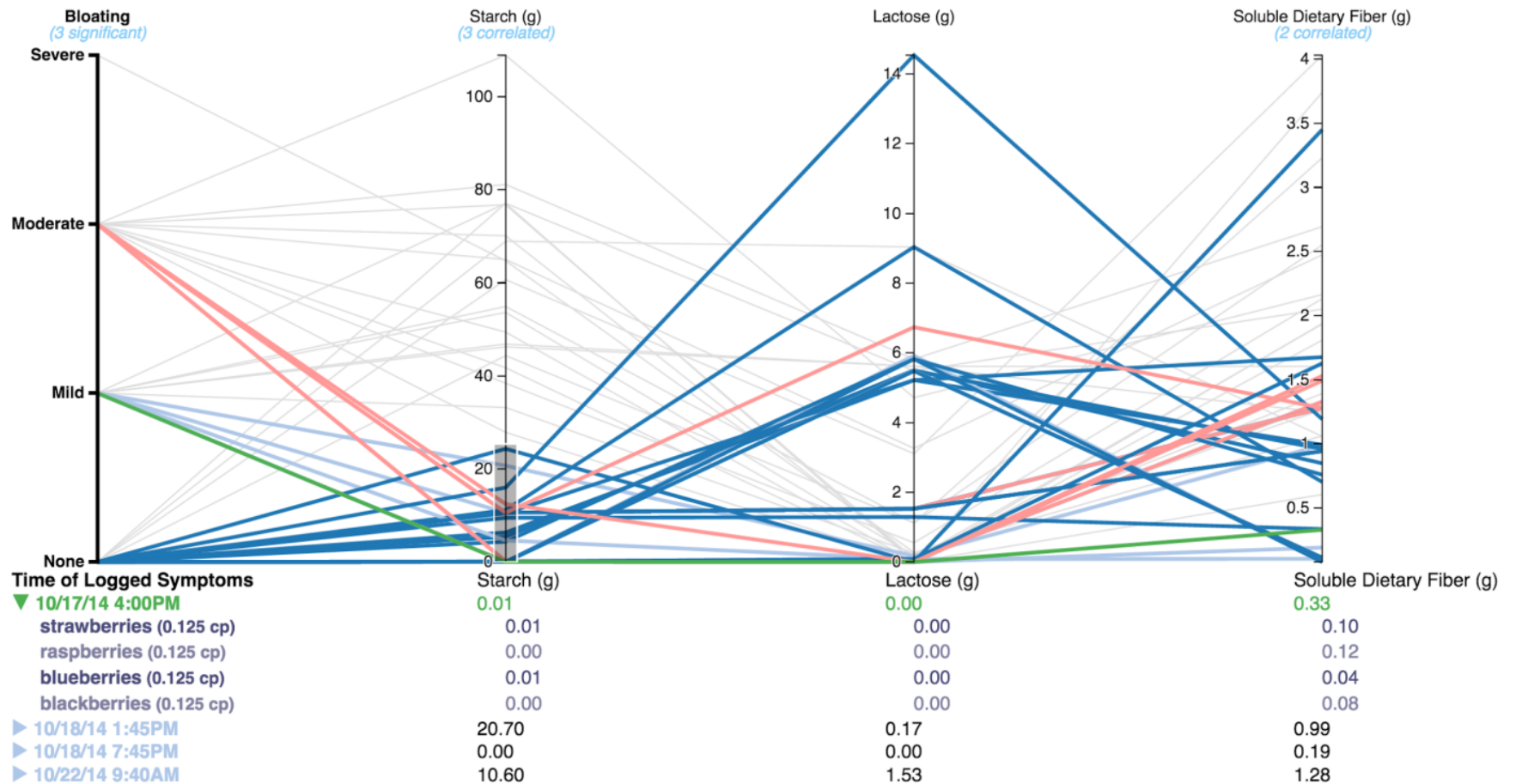
0.00

57.03

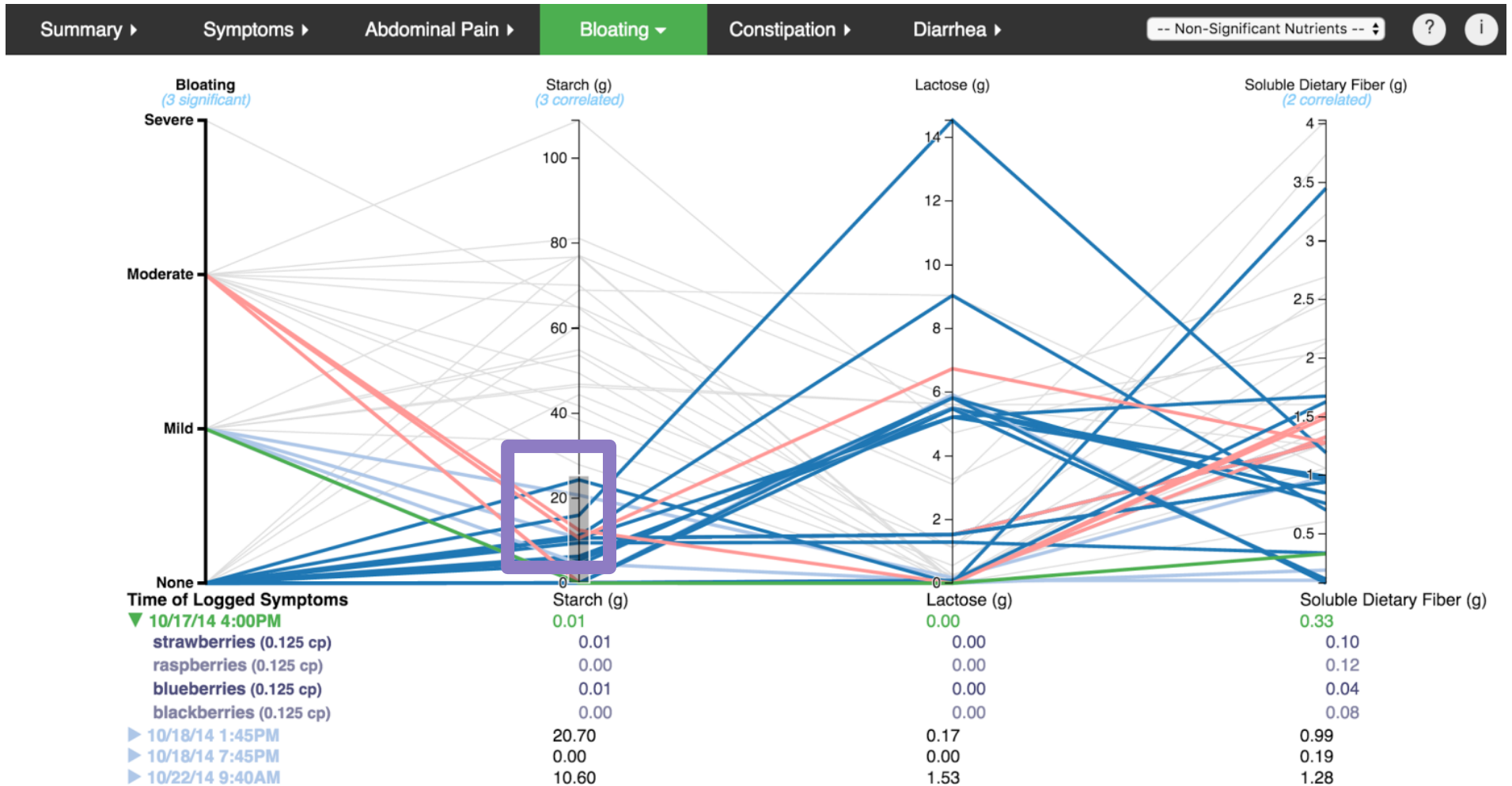
0.00

7.70

visualizing results: parallel coordinates plot

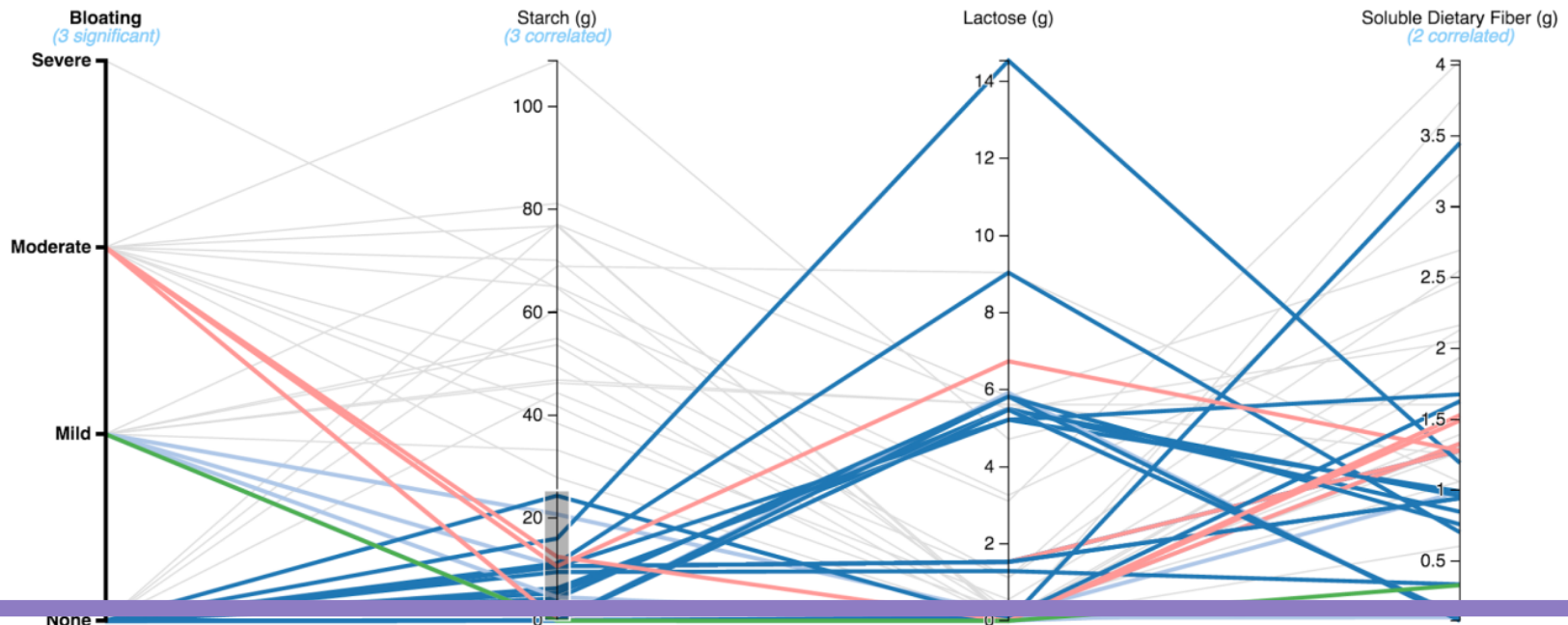


visualizing results: parallel coordinates plot



visualizing results: parallel coordinates plot

[Summary](#) ▶ [Symptoms](#) ▶ [Abdominal Pain](#) ▶ **[Bloating](#)** ▶ [Constipation](#) ▶ [Diarrhea](#) ▶ [-- Non-Significant Nutrients --](#) ? i



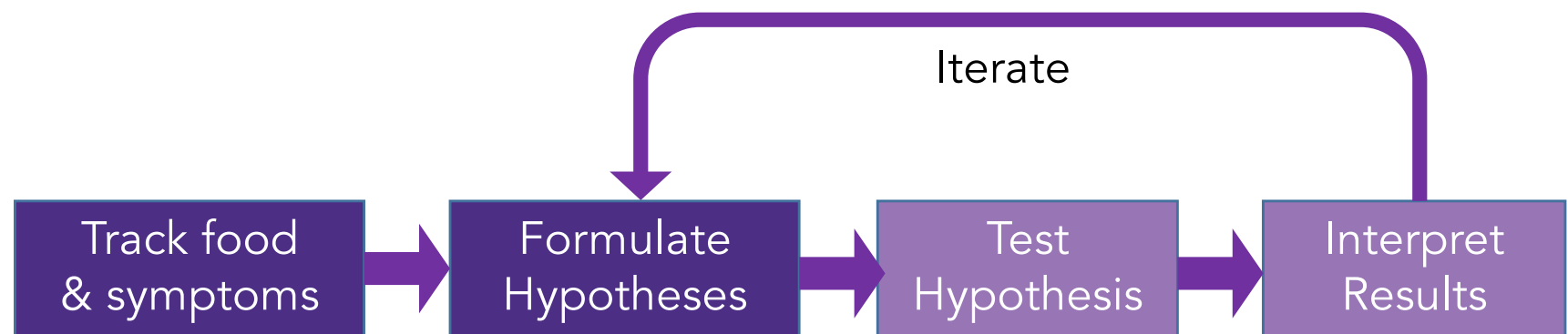
Time of Logged Symptoms	Starch (g)	Lactose (g)	Soluble Dietary Fiber (g)
▼ 10/17/14 4:00PM	0.01	0.00	0.33
strawberries (0.125 cp)	0.01	0.00	0.10
raspberries (0.125 cp)	0.00	0.00	0.12
blueberries (0.125 cp)	0.01	0.00	0.04
blackberries (0.125 cp)	0.00	0.00	0.08
▶ 10/18/14 1:45PM	20.70	0.17	0.99
▶ 10/18/14 7:45PM	0.00	0.00	0.19
▶ 10/22/14 9:40AM	10.60	1.53	1.28

visualizations facilitated collaboration

- Greatly preferred over analyzing paper diaries; reduced burden of synthesis.
- At least initially, patients and providers had concerns about data and results, but these were generally resolved through collaboration.
- Very different preferences for *how* to use these tools.

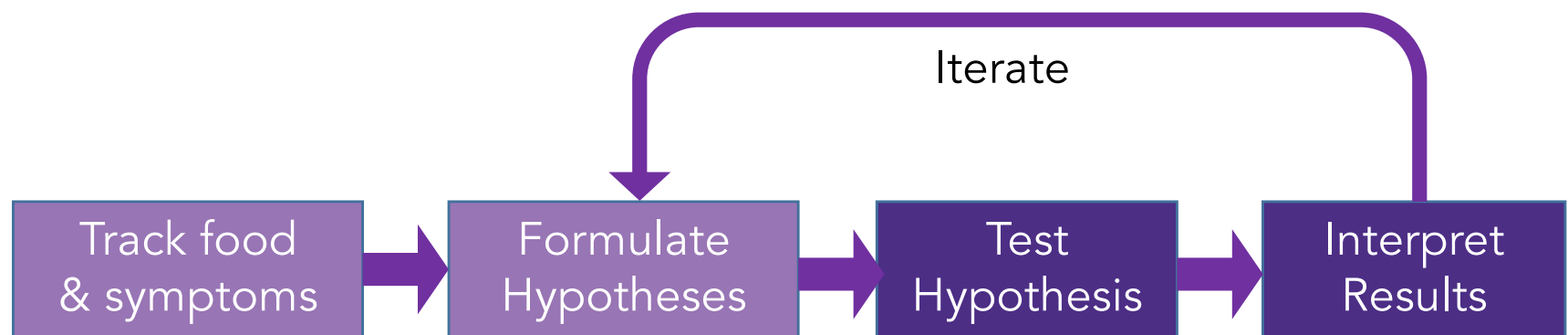
recasting self-tracking

- Hypothesis formation based on journals
- Rethinking trigger detection to rigorously test hypotheses while reducing patient and provider burden.



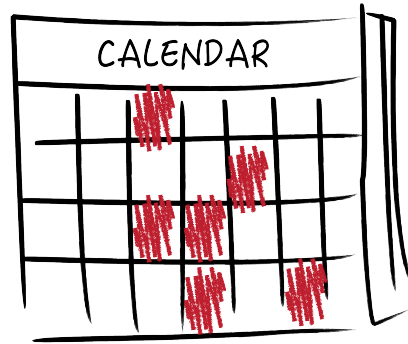
recasting self-tracking

- Hypothesis formation based on journals
- Rethinking trigger detection to rigorously test hypotheses while reducing patient and provider burden.



rigorous testing of hypotheses for IBS food triggers

a new process for Jane



Severe Symptoms

Missing Work

Needs Help

Preparation

Collection

Integration

Reflection

Action

Jane's personal hypotheses



Lactose



?

caffeine



?

Stress



?

Possible Triggers

Lactose

Caffeine

Stress

Confounding Effect

Preparation

Collection

Integration

Reflection

Action

designing a self-experiment



Preparation

< Trial Setup (1 of 4)

1. Choose Symptoms
What symptoms do you want to test? ?

- Abdominal Pain i
- Bloating or Gas i
- Constipation i
- Diarrhea i
- Bowel Urgency i
- + Add symptom >

CONTINUE >

Current Trial My Trials FAQs Settings

Collection

Integration

< Trial Setup (2 of 4)

2. Choose a Possible Cause
Which possible trigger do you want to test? ?

- Eating Large Meals >
- Eating Lactose / Dairy >
- Drinking Caffeine >
- Eating Gluten >
- Eating Fructose >
- Eating Artificial Sweeteners (Sorbitol) >
- Eating High Fat >

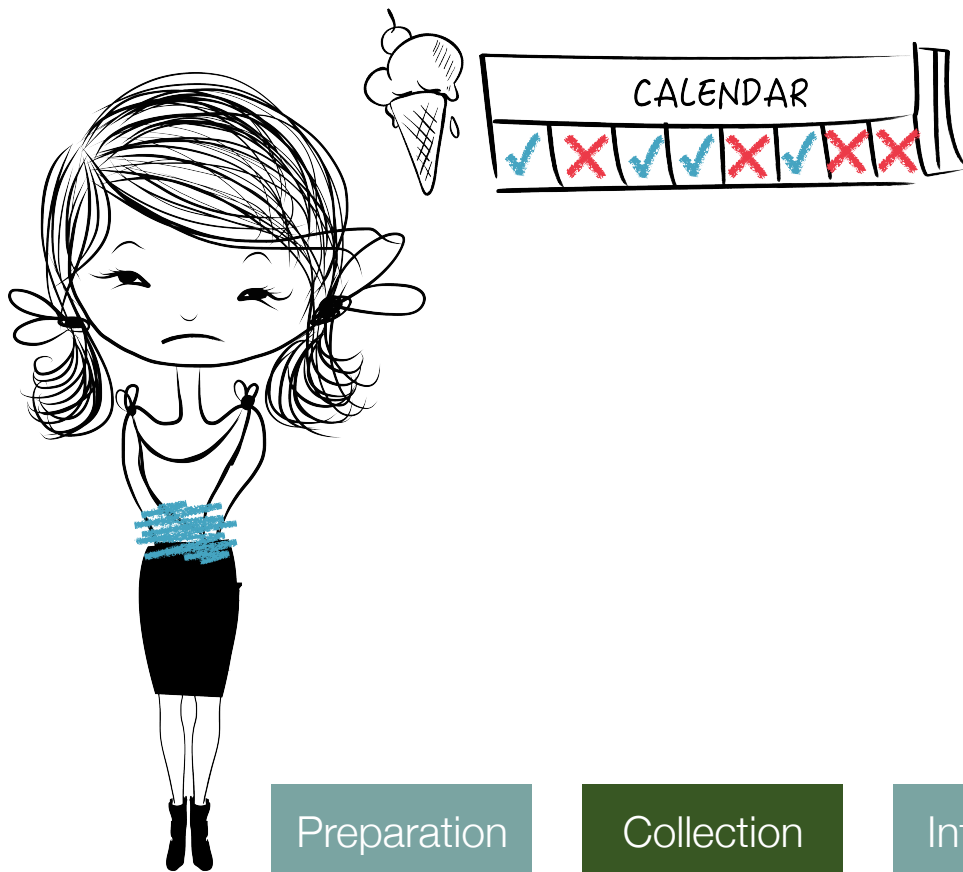
CONTINUE >

Current TrialF My Trials AQsS ettings

Reflection

Action

conducting the self-experiment



Input Symptom Severity

DAY 2/8

TU	W	TH	F	S	SU	M	TU
⊗	28	29	30	31	12		3

LACTOSE

Step 2 of 4

At its worse, how much has your symptom impacted your day since you last ate?

Bloating/Gas Severity ⓘ

😊 Not at all

○ Mildly

● Moderately

● Severely

● Extremely

☹️

Preparation

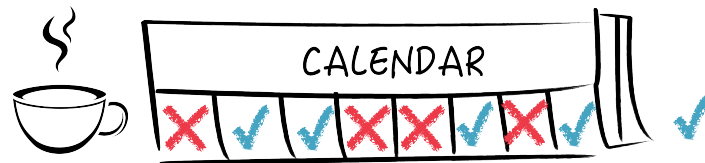
Collection

Integration

Reflection

Action

interpreting results



Preparation

Collection

Integration

Reflection

Action

← Past Studies

Eating Caffeine Study Findings

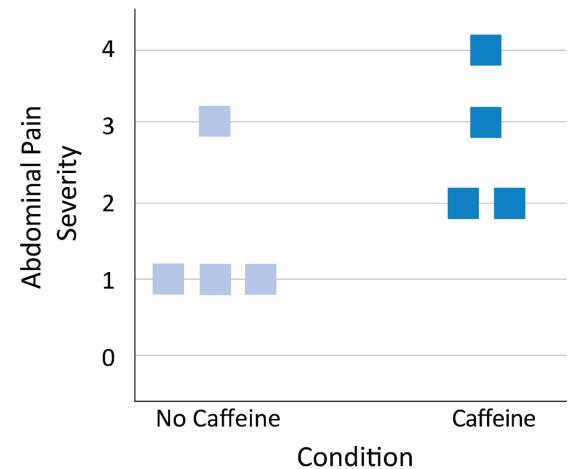
May 27th – June 3rd

Abdominal Pain ⓘ

Based on the study, there is a **no evidence** that your abdominal pain decreases when you don't eat caffeine (p=0.762). ⓘ

Abdominal Pain Severity

May 27th – June 3rd



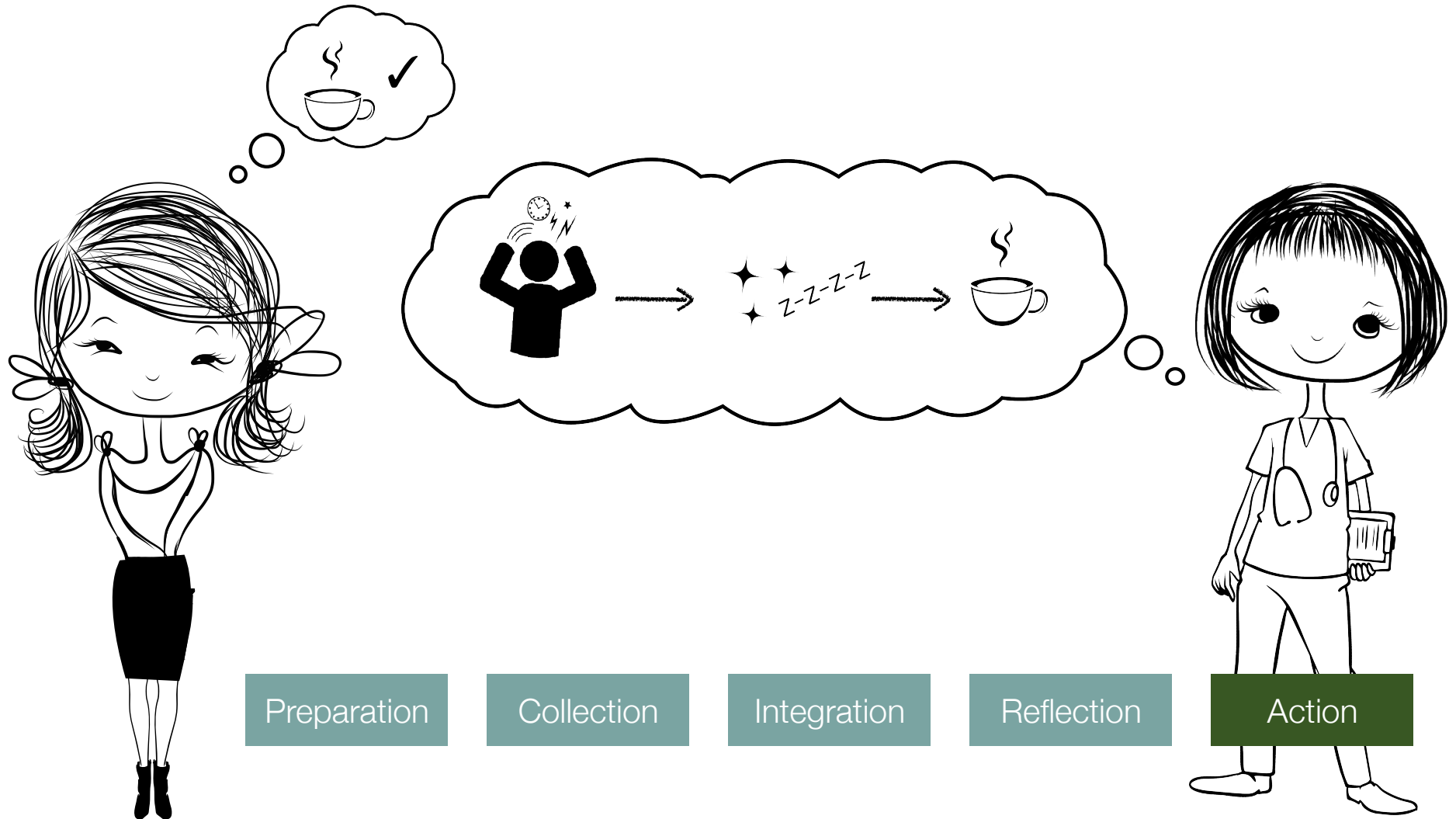
Each square represents one day

FREQUENCY VIEW **VIEW** DAILY VIEW

Reflection min... Action r:

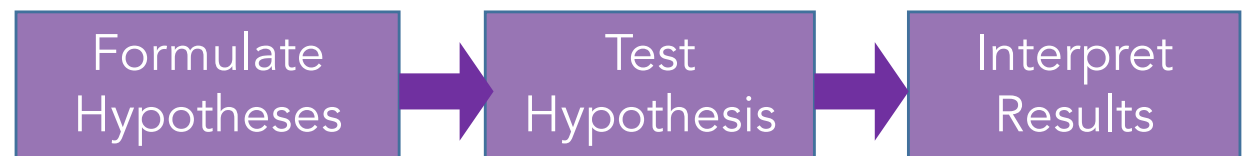
Days without Caffeine was 1.5

actionable answers



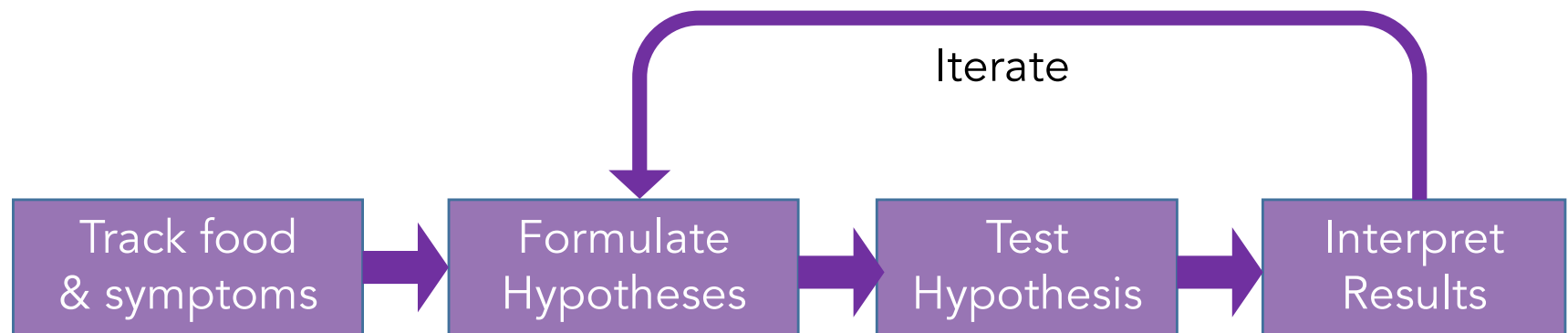
preliminary evaluation (15 person field study)

- High completion rate, low reported burden
- People found results valuable:
 - Valued design of controlled experiment
 - Relied on visual analysis much more than statistical analysis
- Rigor: participants were willing to accept and act on less than scientific standards, to better fit study into their lives.



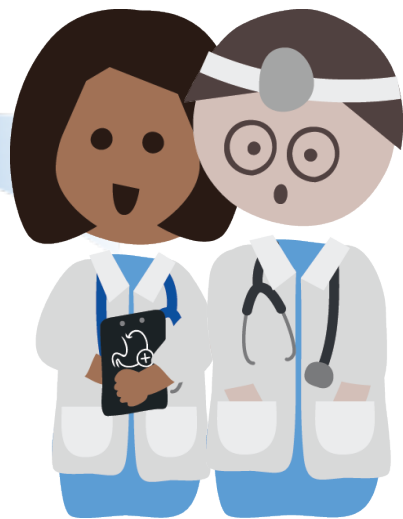
recasting self-tracking

- Hypothesis formation based on journals
- Rethinking trigger detection to rigorously test hypotheses while reducing patient and provider burden.





Individuals



Medical Team



Peers & support networks



Individuals



Medical Team



Peers & support networks

Many apps support sharing to social streams



Just completed a 8.12 mi run with RunKeeper

Duration 1:10:46 | Calories Burned 1281

Average Pace 8:43 / mi | Average Speed 6.88 mph | Elevation Climb 544 ft



Like · Comment · Track your fitness · 38 minutes ago via RunKeeper · 



People seek support from friends & peers

- Accountability
- Emotional support: celebrate successes and commiserate struggles
- Information and advice
- Role models and inspiration

but shares can antagonize friends

- Bore them
- Seem boastful
- Confuse them about what you want

Your friend does not have Facebook so she wants you to know that she ran 5.44 miles in 52 minutes and it felt good. Comments? Likes?



Really bro,
no one cares.

Ugh.

Why would someone
post this?

survey respondents

These are default,
auto posts.

They are not
good posts.



Providing even a tiny bit of context can elicit more support.

btw, people seem to like photos of shoes.



Taylor
@taylorr

Watch my run right now with @RunKeeper Live- cheer me on!
<http://rnkpr.com/a5sjetc> #RunKeeper

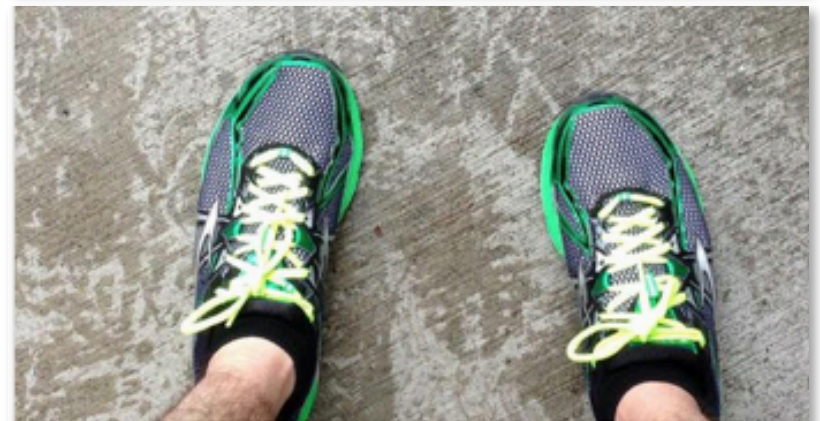
12:17 PM - 8 May 2014



Kendall
@run_kendall

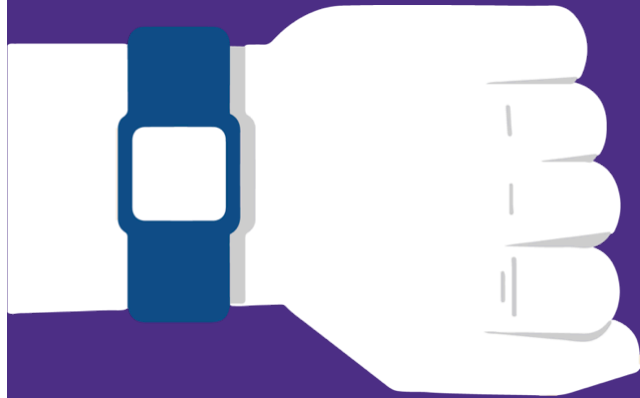
Just posted a 5.74 mi run - first training run for my half!
<http://rnkpr.com/a5sjetc> #RunKeeper

12:17 PM - 8 May 2014



Cameron
@run_cameron

Watch my run right now with @RunKeeper Live- happy to go running!
<http://rnkpr.com/a5sjetc> #RunKeeper



A friend on your wrist?

Social comparisons vs. goals in wearables

field evaluation of several interfaces
to give feedback on physical activity



field evaluation of several interfaces
to give feedback on physical activity





Goal Completion

presents one's progress towards their daily goal



Normly

compares one's goal completion to that of others having a similar walking goal



Normly

Participants were more likely to initiate a new walk when closely ahead or behind of others,

Participants would take an average of **5 minutes** to start a new walk, and walk **394 steps**, when seeing themselves ahead or behind others, up to **500 steps**,

Usage sessions per day

Goal Completion

108



Normly

122



Steps per day

Goal Completion

5340



Normly

5460



Can we combine
goals and monitoring
to generate support
and accountability?





Progress Report

You committed to walk at least 3400 steps per day on at least 4 days this week.

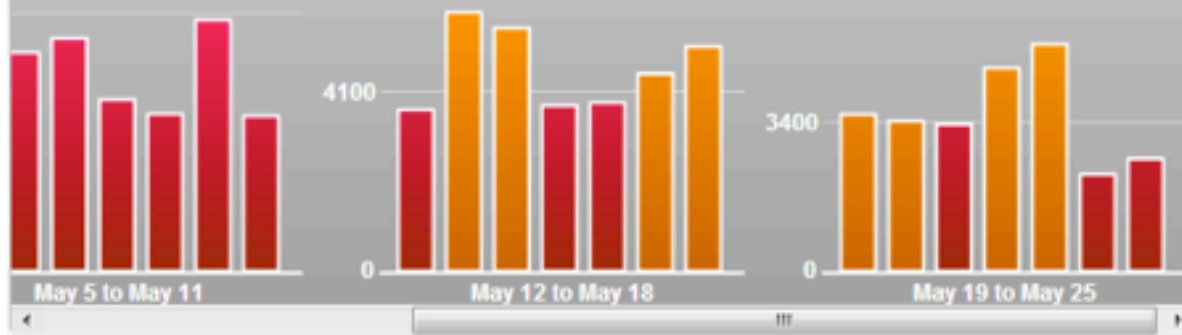
Your progress

1 day completed
3 to go

last upload May 19, 6:10AM

3591 steps today
191 above target!

Your walking history



Your commitment history

Week	Daily target	Committed days	Successful days
May 19 - May 25	3400	4	4
May 12 - May 18	4100	0	0



Progress Report

You committed to walk at least 3400 steps per day on at least 4 days this week.

Your progress

1 day completed
3 to go

3591

steps today
191 above target!

last upload May 19, 6:10AM

- Algorithmically set daily target
- Participants optionally commit to how many days that week they will strive to achieve it

Your commitment history

Week	Daily target	Committed days	Successful days
May 19 - May 25	3400	4	4
May 12 - May 18	1100	0	0



September 23 via Commit to Steps 



Met my commitment last week. Yay! 5 days over my daily steps target, just like I said I would.

Next week's commitment (week 7): 5 days over 10000 steps. Please encourage me or, better yet, walk with me.

Like · Comment · Promote · Share




and 6 others like this.



Go !

September 24 at 6:31am via mobile · Like



 Thanks, everyone! The treadmill desk makes it a lot easier to hit 10K in a day. But I did go running once last week...







September 24 at 4:05pm · Like



Write a comment...



Three versions

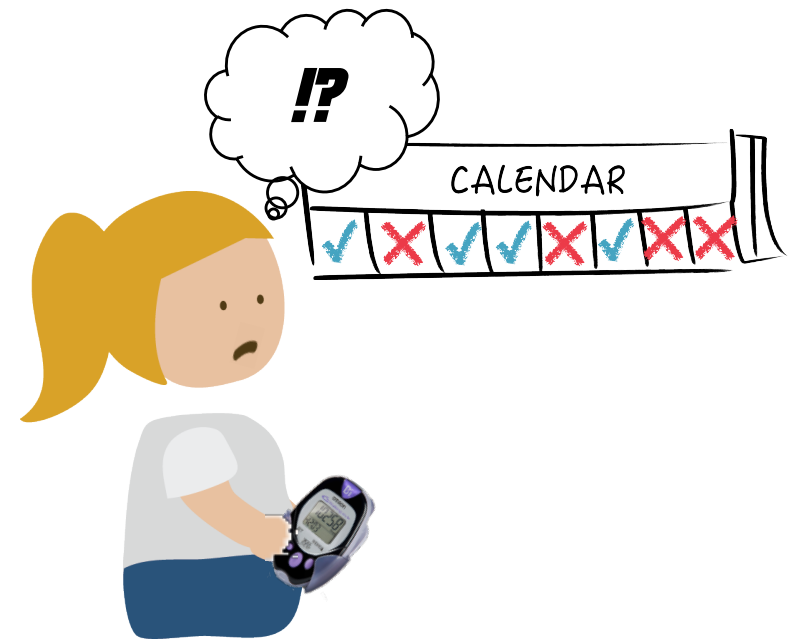
	Goal	Outcome
Private		
Announce goal		
Announce goal and results		

results



- Public posts about goals and outcomes were met with emotional, informational, and instrumental support.
- People in the public outcome condition were less likely to set a commitment, but, if they set one, more likely to achieve it.
- Novelty wore off over 12 weeks – people received fewer likes and comments with time.

Can friends use data to help people develop specific, tailored plans?



three domains



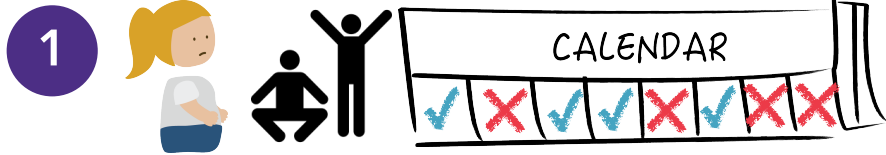
exercise



spending



diet



1

Choose domain

Keep 1-week activity log

Goal: Eat more fruits and vegetables

Preferences/constraints

My preference is to avoid take out food and pack a lunch if I am away from home all day

1 Week Activity Log

Breakfast

2 pop tarts

Lunch

Chicken drumettes (3)

Half ear of corn

Baked beans

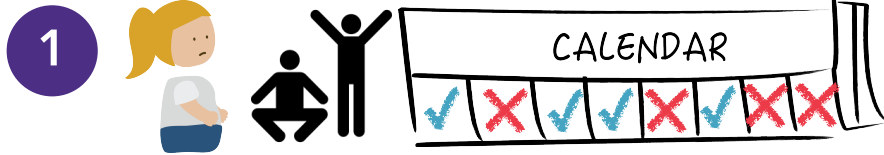
Half of a snapple lemon tea

Dinner

Half rack of bbque ribs, side of apples

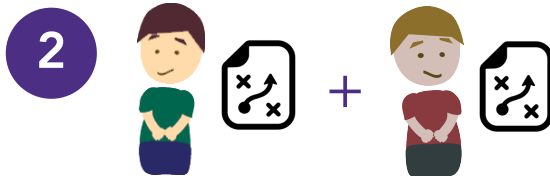
Snack

Fries with cheese and chives half a cup



1

Choose domain
Keep 1-week activity log



2

Send to a stranger and a friend, each of whom creates a plan for the next week

Goal: Eat more fruits and vegetables

Preferences/constraints

My preference is to avoid take out food and pack a lunch if I am away from home all day

1 Week Activity Log

Breakfast

2 pop tarts

Lunch

Chicken drumettes (3)

Half ear of corn

Baked beans

Half of a snapple lemon tea

Dinner

Half rack of bbque ribs, side of apples

Snack

Fries with cheese and chives half a cup

Monday

Breakfast

Apple with peanut butter and yogurt

Lunch

Grilled chicken on a tortilla wrap with turkey, lettuce, tomato, mayo,

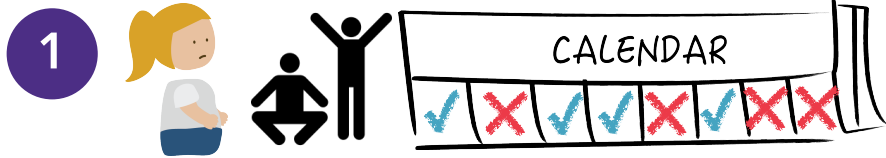
Unsweetened tea

Dinner

1 piece BBQ chicken, corn and broccoli, crystal light water

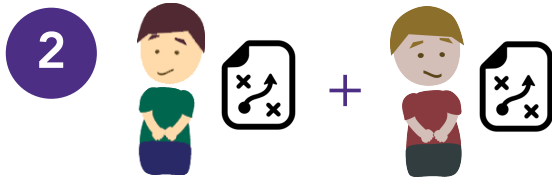
Snack

String cheese with 6 crackers, water



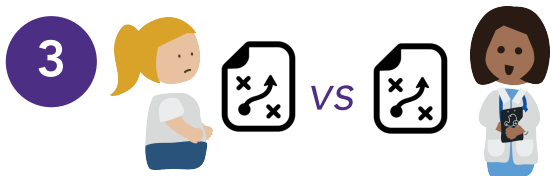
1

Choose domain
Keep 1-week activity log



2

Send to a stranger and a friend, each of whom creates a plan for the next week



3

Compare: plannee's perspective, expert ratings

Goal: Eat more fruits and vegetables

Preferences/constraints

My preference is to avoid take out food and pack a lunch if I am away from home all day

1 Week Activity Log

Breakfast

2 pop tarts

Lunch

Chicken drumettes (3)

Half ear of corn

Baked beans

Half of a snapple lemon tea

Dinner

Half rack of bbque ribs, side of apples

Snack

Fries with cheese and chives half a cup

Monday

Breakfast

Apple with peanut butter and yogurt

Lunch

Grilled chicken on a tortilla wrap with turkey, lettuce, tomato, mayo,

Unsweetened tea

Dinner

1 piece BBQ chicken, corn and broccoli, crystal light water

Snack

String cheese with 6 crackers, water



Overall

- Experts rated 74% of plans as very or somewhat likely to improve behavior.
- Participants rated 68% of plans as a good or very good fit with their life.



Friend-generated plans

- More likely to fit with plannee's life, but less likely to push them
- Plannee imagined doing activities with friend or being held accountable



Stranger-generated plans

- Pushed plannees' further, toward greater behavior change and improvement
- More likely to contain novel ideas, which can be engaging or curiosity provoking
- Less of a fit



Friend-generated plans

- More likely to fit with plannee's life, but less likely to push the plannee
- Plannee imagined as a friend or being held

How should designers combine the strengths of each?



Stranger-generated plans

- Pushed plannees' further, toward greater behavior change and improvement
- More likely to contain novel ideas, which can be engaging or curiosity provoking
- Less of a fit



Individuals



Medical Team



Peers & support networks



Individuals



Medical Team



Peers &
support networks
& strangers



New tools are needed to support collaboration between people and experts.

These tools must balance scientific rigor with their ability to fit in people's lives.

support networks



Friends and peers benefit from some context or a direct ask – it can turn boredom or a negative reaction into help.



**Peers &
support networks**

Individuals

Medical Team



When given data and engaged in a task, friends and strangers can produce good advice! Advice from each has different strengths.



Peers & support networks

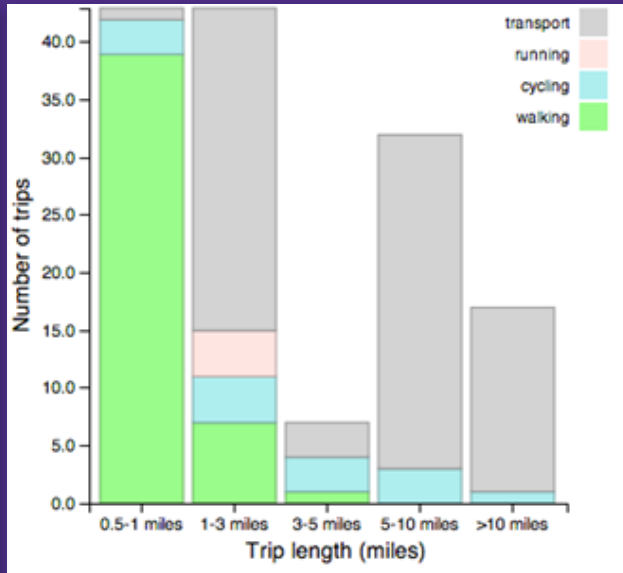
Individuals

Medical Team

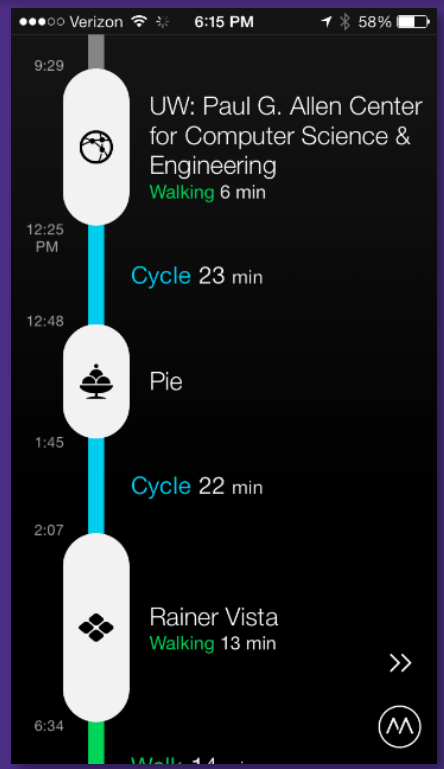
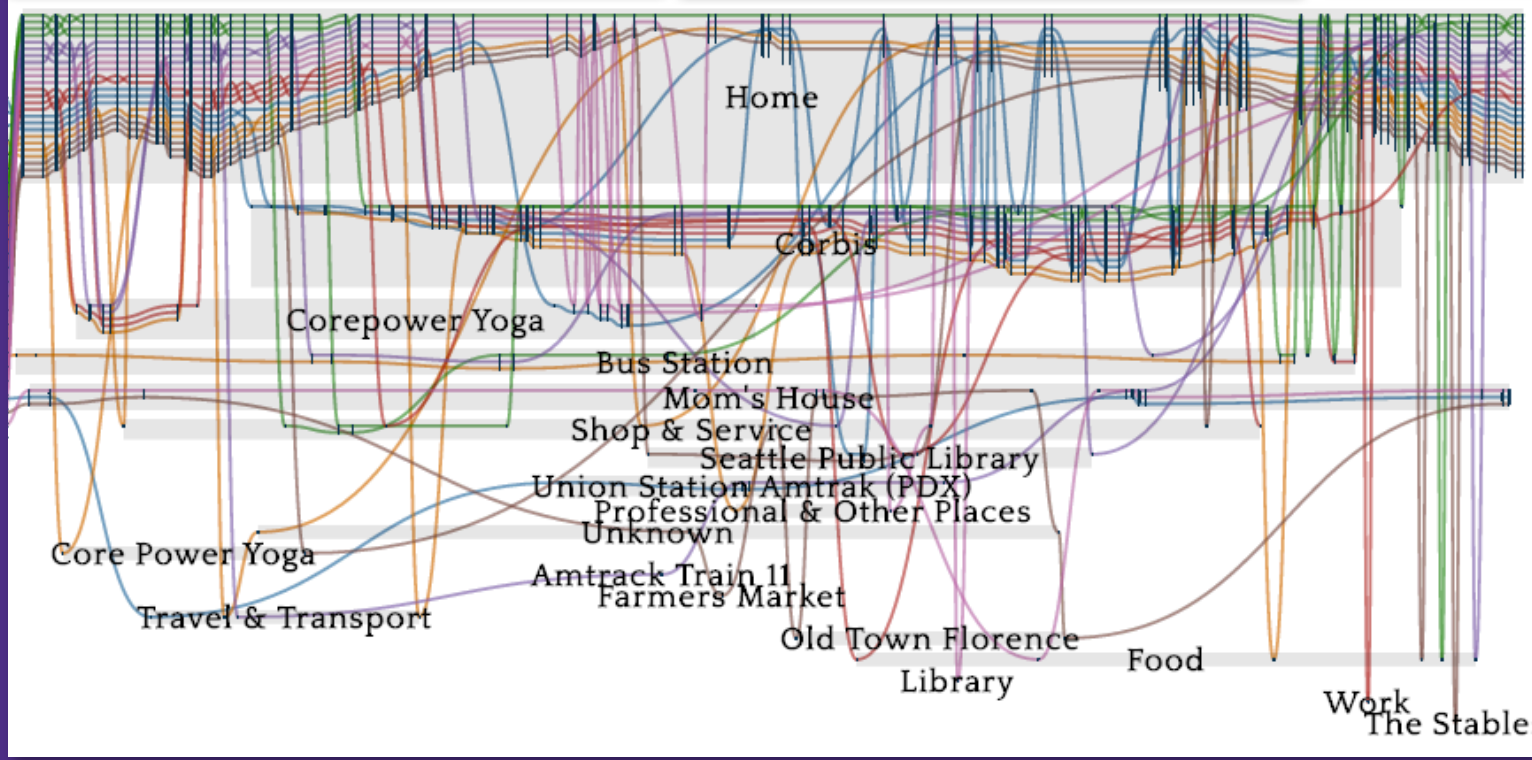
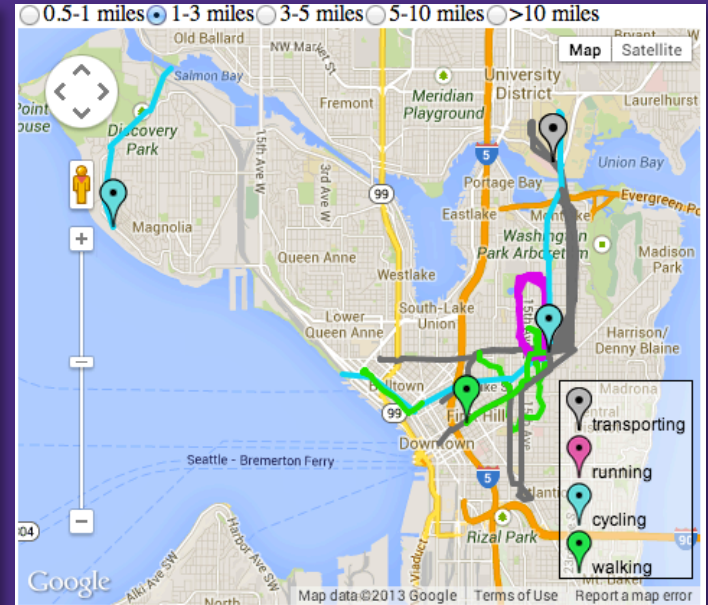
Day of week **Time (in hours)**

Sunday (0 days)	--
Monday (2 days)	8 hours, 21 minutes
Tuesday (2 days)	7 hours, 49 minutes
Wednesday (4 days)	7 hours, 10 minutes
Thursday (4 days)	7 hours, 48 minutes
Friday (3 days)	5 hours, 47 minutes
Saturday (0 days)	--



On average, you spend 1.6 fewer hours at work on Fridays.



You transport 2% of the time you travel less than 1 miles.





Diary				
TODAY				
1,210	1,077	285	792	418
GOAL	FOOD	EXERCISE	NET	REMAINING
Breakfast		500 cal 		
Strawberries - Raw		49		
1 cup, halves				
1 Scrambled Egg White		17		
1 egg white				
Honey		304		
100 g				
Nonfat Greek Strained Yogurt		130		
Fage, 1 cup (227 g)				
Lunch		577 cal 		
Cilantro Lime Vinaigrette Dressing		180		
Nordstrom Cafe, 2 TBSP				
Beans - Black, cooked, boiled, with salt		227		
1 cup				
100% Apple Juice		120		
Old Orchard, 8 oz				
Guacamole Medium		50		

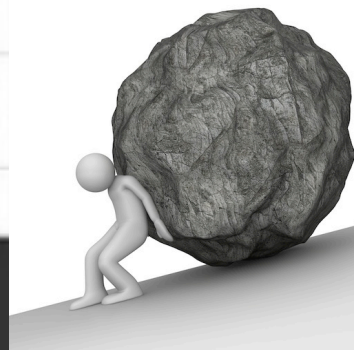
Food journals can help people eat healthier and tune their diet.

Diary				
TODAY				
1,210 GOAL	1,077 FOOD	285 EXERCISE	792 NET	418 REMAINING
Breakfast				500 cal
Strawberries - Raw 1 cup, halves				49
1 Scrambled Egg White 1 egg white				17
Honey 100 g				304
Nonfat Greek Strained Yogurt Fage, 1 cup (227 g)				130
Lunch				577 cal
Cilantro Lime Vinaigrette Dressing Nordstrom Cafe, 2 TBSP				180
Beans - Black, cooked, boiled, with salt 1 cup				227
100% Apple Juice Old Orchard, 8 oz				120
Guacamole Medium				50

Food journals can help people eat healthier and tune their diet.

but...

- they are high-burden
- they can feel judgy
- they can nudge people to eat things that are easier to log.





Diary +

TODAY

1,210 GOAL	1,077 FOOD	285 EXERCISE	792 NET	418 REMAINING
---------------	---------------	-----------------	------------	------------------

Breakfast 500 cal

Strawberries - Raw 1 cup, halves	49
1 Scrambled Egg White 1 egg white	17



Is there another way?

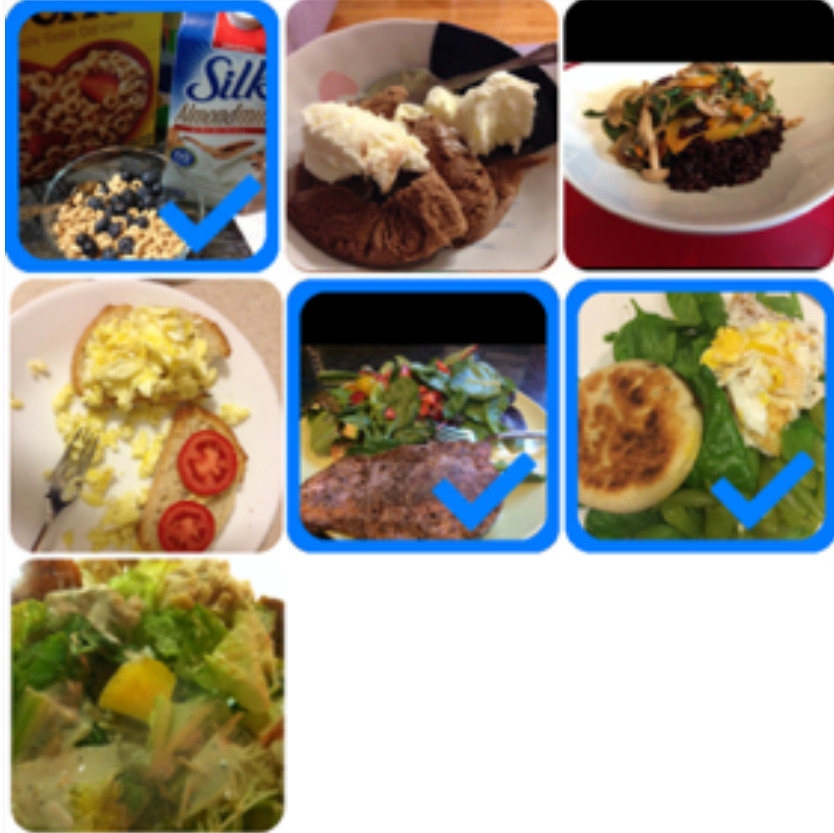
Lunch 577 cal

Cilantro Lime Vinaigrette Dressing Nordstrom Cafe, 2 TBSP	180
Beans - Black, cooked, boiled, with salt 1 cup	227
100% Apple Juice Old Orchard, 8 oz	120
Guacamole Medium	50



History

Week of Monday, July 21, 2014



Food4Thought

History

- Thursday July 24 Eat something that is good for your eyes.
- Wednesday July 23 Eat something containing no carbs.
- Tuesday July 22 Eat something cooked in a healthy oil.
- Monday July 21 Eat something that is good for your immune system.
- Sunday July 20 Eat something high in vitamin D.
- Saturday July 19 Eat something that contains monounsaturated fat.

Four versions



Social features



No social features



Nutrition challenges



Non-nutrition challenges



Nutrition challenges

Nutritionally prescriptive, serious, conventional

- Eat something high in fiber
- Eat something with at least 20 grams of protein
- Eat something that is good for your eyes



Non-nutrition challenges

fun, curiosity inspiring, random, varied

- Eat something that is yellow
- Eat something that an elephant would eat
- Eat something that reminds you of your high school years



Social features



 shared her photo.
Food4Thought

Arugula!




Todays Challenge: Eat something that starts with the letter 'A'.


Like · Comment

 and  like this.

✓ Seen by 21

 Nice! I was getting bored of the apples 😞 I'm trying to think of something else A-related for my post!

Like

 Haha, we (including myself) have all been quite creative with our apple submissions.

Like



Nutrition challenges

- Higher engagement
- More judgy



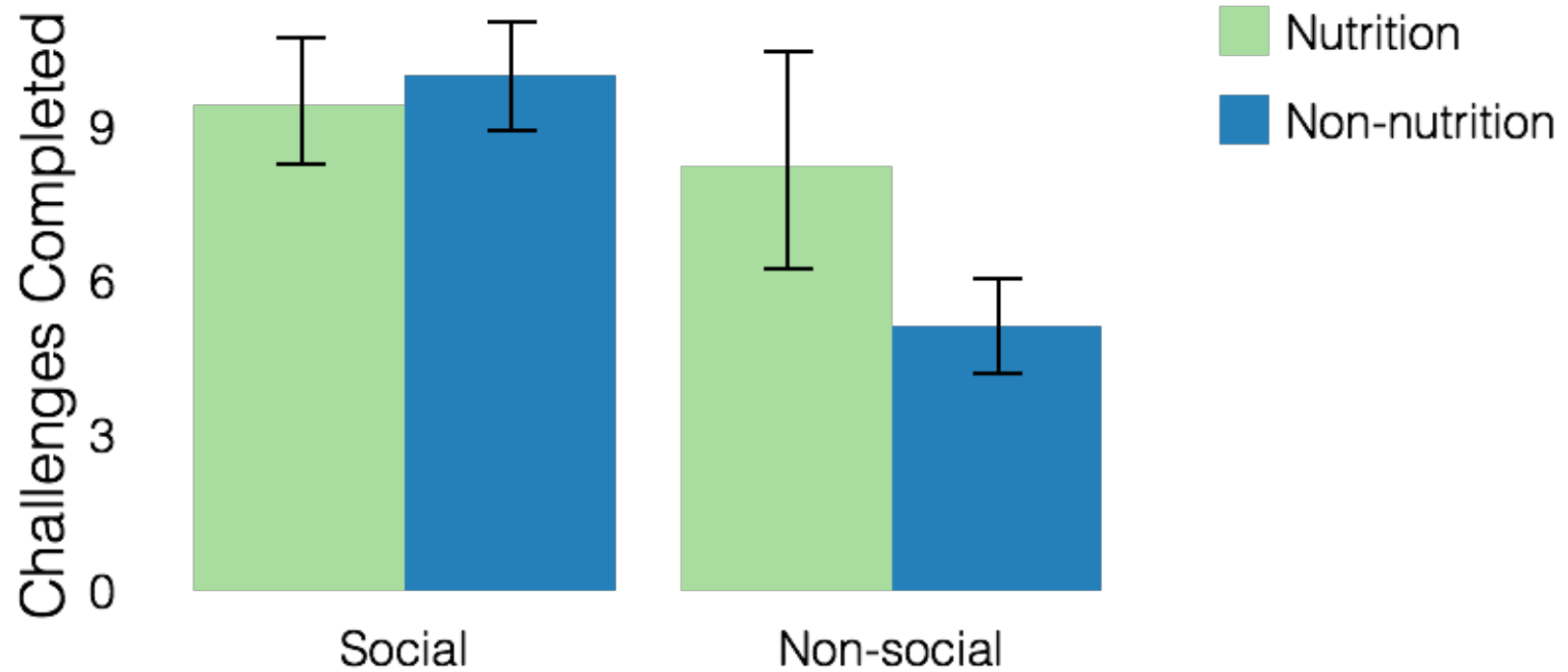
Non-nutrition challenges

- Greater gains in food mindfulness
- Challenges and activity felt more arbitrary

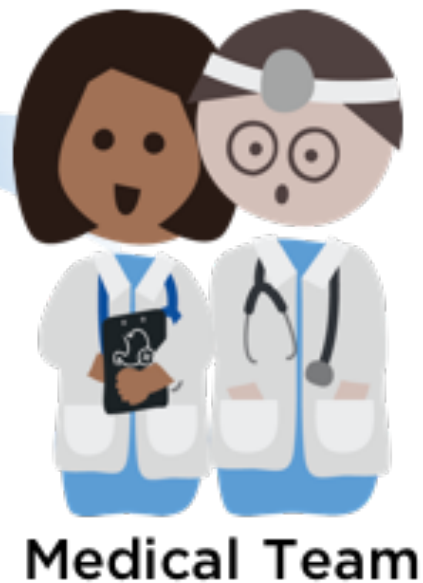


Social features

- Completed more challenges
- Less likely to use the app to record other foods



It's not all/always about the data.
It's not always about correction.



From Personal Data to Action: Making Personal Informatics Work

Sean Munson · smunson.com · [@smunson](https://twitter.com/smunson)

AHRQ#1R21HS023654

NSF# OAI-1028195, IIS-1344613, IIS-1553167

University of Washington Innovation Award

Intel Science and Technology Center for Pervasive Computing

Robert Wood Johnson Foundation



HUMAN CENTERED DESIGN & ENGINEERING
UNIVERSITY of WASHINGTON



From Personal Data to Action: Making Personal Informatics Work

Sean Munson · smunson.com · [@smunson](https://twitter.com/smunson)

Many collaborators, but especially PhD students who lead the projects:



Daniel
Epstein



Christina
Chung



Elena
Agapie



Jessica
Schroeder



Ravi Karkar



Jane
Hoffswell



Ruben
Gouveia



HUMAN CENTERED DESIGN & ENGINEERING
UNIVERSITY of WASHINGTON

