

Example Conversations: Healthy Behavior Change

- This presentation is a retrospective across different projects 2011 - 2018: my chain of related thinking developed over multiple projects
- Rationale for this retrospective:
 - Show snippets of a number of innovations methods working together
 - Show continuity across many projects over a span of time
- This talk covers different phases from a few different projects
- All contributing to the overall goal of understanding how people can change to healthier behaviors

Theory ~2011

Groundwork informing many subsequent projects

Methods

- Literature Review**
- Consensus Building**
 - Lots of team discussion, managing up, 'rainmaking', etc.
 - "There's lots of low hanging fruit, let's show progress"
 - vs "Effecting change in people requires key insights"

Participants

- People engaged in health behavior changes.
- Expert Personal Trainers/Nutrition Consultants (4)
- Their Clients (8) / Non-Clients (2)
- Program Administrators (2)

ID	Role	Gender	Age	Interview	Observe Training	Observe Consultation	Laddering Interview
P01	Administrator	F	30+	3/1/12			
P02	NonClient	M	40s	4/19/12			
P03	NonClient	F	40s	5/29/12			
P04	Trainer/Administrator	M	30s	6/5/12			6/19/12
P05	Trainer	F	40s	6/7/12			6/19/12
P06	Client	F	30s	6/13/12	6/14/12		
P07	Client	F	30s	6/13/12	6/13/12		
P08	Client	F	30s	6/14/12			
P09	Client	F	30s	6/14/12			
P10	Client	F	30s	6/14/12		7/10/12	6/19/12
P11	Client	M	30s	7/20/12			
P12	Trainer	F	30s	7/20/12			
P13	Client	M	30s	7/31/12			
P14	Trainer	M	30s	7/31/12			
P15	Client	M	30s	8/6/12			

Trainers/Nutrition Consultants Interviews

- Tell me about your very last client
 - How did you meet? How did the session start last time?
 - Go wherever the conversation leads...
- Repeat for next client until becomes repetitive
- Fill in the edges:
 - Your most successful client, client you stopped seeing...

Client Interviews

- **What have you eaten today?**
 - And go on wherever that leads
 - What next?
 - What tomorrow? ...
- Same for physical activity
- Explore edges more (found in prior interviews)
 - Are you currently participating in a specific weight loss/physical activity program?
 - Do you travel?
 - Can you tell me about a good choice you? Poor choice?

What the data looks like... Structure Interviews

Interviewer: So, what have you eaten today?

Interviewee: Let's see, I've eaten a bowl of Trader Joe's Honey Nut O's with 2 percent milk a little over the serving size but not too much. Then I ate a protein bar and a banana and had a glass of milk, 2 percent. Then for lunch I had a spicy salmon bowl from the Thai restaurant by my work. It's raw salmon with this spicy sauce and vinaigrette rice and greens and avocado slices. Also had a glass of milk with that. And then my afternoon snack I had salami, a little bit of baguette, some brie and a little bit of sparkling wine because it was thirsty Thursday at the office. And then I have not yet eaten any dinner although I should have. Don't tell [Trainer], okay?

Interviewer: Why the cereal this morning?

Interviewee: Because it's easy and it's quick and it's my all time favorite breakfast food

What the data looks like...

Interviewer: So, what have you eaten today?

Interviewee: Let's see, I've eaten a bowl of Trader Joe's **Honey Nut O's** with **2 percent milk** a little over the serving size but not too much. Then I ate a **protein bar** and a banana and had a glass of **milk, 2 percent**. Then for lunch I had a spicy **salmon** bowl from the Thai restaurant by my work. It's **raw salmon** with this spicy sauce and vinaigrette **rice** and **greens** and **avocado slices**. Also had a glass of milk with that. And then my afternoon snack I had **salami**, a little bit of **baguette**, some **brie** and a little bit of **sparkling wine** because it was thirsty Thursday at the office. And then I have not yet eaten any dinner although I should have. Don't tell [Trainer], okay?

Interviewer: Why the cereal this morning?

Interviewee: Because it's easy and it's quick and it's my all time favorite breakfast food

OK
Hmmm
Oh oh

Analysis of structured interviews

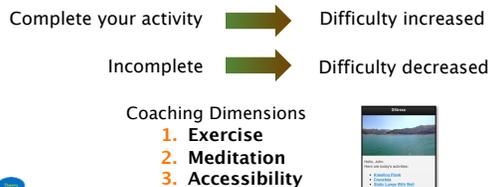
- Analysis questions
- What **+helps** or **-hinders** in daily decisions for eating and physical activity?
- Analysis method
- **Entity-relationships for actions people take, with resources, in contexts**
 - **Context**
 - "Men can shower and be back at work in an hour. Women can't [!]"
 - Coded as => (context:self, -gender)
 - **Activity**
 - "We were doing a lot of Qivana during the day; the shakes"
 - Coded as => (act:eat,+social +nutraceutical)
 - **Resource**
 - "One of my clients sent this little thank you for ... and it had a pedometer in it"
 - Coded as => (resource:tech, +social), where 'social' means others involved

Design of Prototype and Experiment

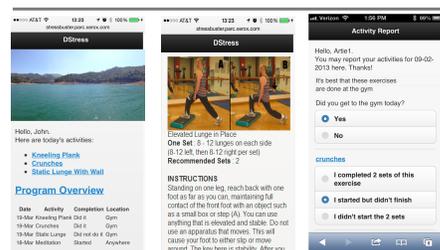
- Strike balance between Goal Setting and Self-Efficacy Theory
 - More challenging goals are motivating vs. Successful completion of the planned goals are more important than the goal itself
- Measure compliance with healthy activity reporting and any reported stress reduction
- Hypothesis
 - Adaptive coaching that adjusts difficulty over time can resolve the Goal Setting/Self Efficacy tension
 - 'Goldilocks' – get the difficulty just right

Dstress Prototype

Does adaptive, in-your-pocket coaching work?

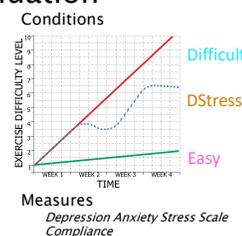


Prototype Implementation



Adapted Django/Python static model and system for adaptive activities, jQuery Mobile UI instead of iPhone app

Evaluation



Significant Results

- *DStress reduced Stress more than Easy or Difficult*
- *DStress and Easy more compliant than Difficult*

Measures
Depression Anxiety Stress Scale
Compliance

Summary



- Identified a need for an agile framework for behavior change study and created a first Web-based prototype for it far quicker than any previous attempt
- A successful summer intern project
 - Konrad, A., Bellotti, V., Crenshaw, N., Tucker, S., Nelson, L.D., Du, H., Pirolli, P., Whittaker, S., Finding the Adaptive Sweet Spot: Balancing Compliance and Achievement in Automated Stress Reduction, to appear in Proc. 33th Annual CHI Conference on Human Factors in Computing Systems (CHI 2015), 2015.

Going beyond one Specific Study

~2017

An architecture and agile process for behavior change study
We were getting studies done, but native mobile apps very constraining
Must have agility, and deploy across platforms

Method

- **Generalize data models** previous specific studies
- Deploy on **agile** framework
- Make as much study-specific interaction **data-driven**
- Create a 'research product'
 - Open source based: Meteor/Node/Javascript/Cordova/Mongo DB/JSON/HTML5
 - Deploy on Cloud services (AWS, etc)

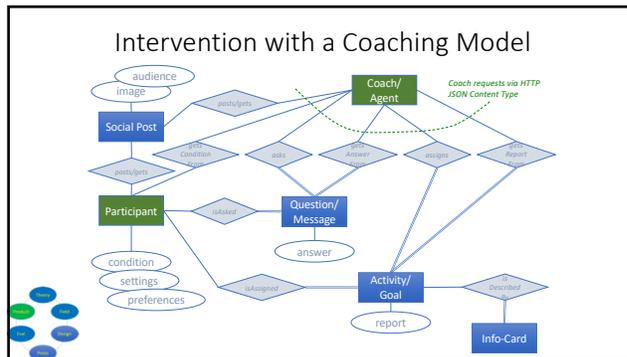
Studies Presented in Two Views

Admin via Web

User in App

Activities/
Reports

Questions/
Answers



Participants

```

{
  "emailAddress": "tneison@parc.com",
  "condition": "12-10",
  "settings": {
    "selfEfficacy": "high",
    "reminders": "yes",
    "reminderDistribution": "masked",
    "reminderCount": "7",
    "challengeActivities": "/content/12/activitySchedule12.json"
  },
  "preferences": {
    "goalType": "...",
    "goalSpecific": "...",
    "dailyGoalText": "...",
    "difficulty": "...",
    "goalContext": "...",
    "choice": "...",
    "place": "...",
    "person": "...",
    "eventTime": "...",
    "reminderPeriod": "...",
    "reminderText": "...",
  }
}
    
```

Set by JSON Import

Set by Q&A

Example HTTP API Call
 curl -H 'Content-Type: application/json' -X POST
 -d @/Users/nelson/meteor_home/positiveday12/data/json/onboarding12.json
 https://localhost:3000/serviceapi/participants/add/tokenvalue

Scheduled Messages

```

{
  "name": "goalTypeSelect",
  "constraints": [ { "attribute": "preferences.goalType", "value": "" } ],
  "askDate": "1",
  "askTime": "07:00",
  "expireDate": "28",
  "expireTime": "23:59",
  "sequenceBase": 10,
  "questions": [
    {
      "tag": "goalType",
      "text": "Which health goal below would you like to pursue?",
      "responseFormat": "list-choose-one",
      "choice": "1",
      "eatSlowly": "Eat slowly and mindfully",
      "walk": "Walk everyday",
      "eatVeggies": "Eat more vegetables"
    },
    {
      "preferenceToSet": "goalType"
    }
  ]
}
    
```

Set by JSON Import

Defines Q&A (and other messaging)

Tasks (aka Activities, Goals)

```

{
  "emailAddress": "with.reminders@parc.com",
  "title": "Stretch for 5 minutes and walk for 15 minutes in the night",
  "contentLink": "12_Walk",
  "scheduledDate": 1,
  "goalMet": true,
  "reportCreatedAt": "2016-11-16T21:16:27.470Z",
  "reportUpdatedAt": "2016-11-16T21:16:31.575Z",
  "goalDifficulty": 3,
  "goalConfidence": 3,
  "goalKeenness": 3,
  "goalWorthEffort": 2
}
    
```

Set by JSON Import

Set by Answering post-Reporting Questions

Social Posts

```

{
  "emailAddress": "parccoach@parc.com",
  "comments": [
    {
      "source": "Les",
      "comment": "Say what?",
      "createdAt": "2016-10-20T20:21:08.386Z"
    }
  ],
  "images": [
    {
      "data:image/png;base64:JVBO...SuQmCC"
    }
  ],
  "likers": [
    "LGFrdKQpaerSrnLNdM"
  ],
  "likes": 1,
  "text": "mmm, kale!",
  "thumbnail": "defaultProfilePicture.png",
  "audience": "team:Breakfast Club",
  "audience": "peers:Les:Rudolph",
  "createdAt": "2016-10-12T20:56:53.605Z"
}
    
```

Either OR →

Touch Screenshots

Summary

- Open sourced last week at github.com/PARC/fittle
- Studies using this framework
Pirolli P, Mohan S, Venkatakrishnan A, Nelson L, Silva M, Springer A, Implementation Intention and Reminder Effects on Behavior Change in a Mobile Health System: A Predictive Cognitive Model, J Med Internet Res 2017;19(11):e397 (2017).

More in progress now



Creating novel user experiences

When out in a Dappled World,
Don't live like a pigeon
Have a conversation between disciplines
'UX', 'UR', 'DS', 'SE', 'TE', ETC
are not truly separable

QUESTIONS?
lester.d.nelson@gmail.com