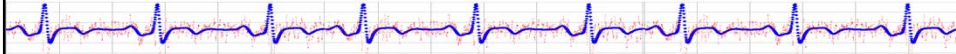


# Empirical Research Methods [in Information Science]

IS4800 / CS6350



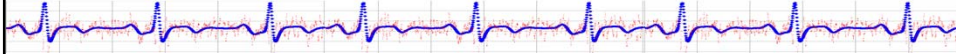
Prof. Timothy Bickmore

Note: CS6350 seminar W2-3pm WVH4th floor CR

Lecture 1 - Introduction

1

## Starter Notes



- Empirical research methods in Information Science
- What is a research method?
  - standards a given community establishes for what is to be counted as knowledge (truth? Beliefs?)
    - Moves from philosophical assumptions to a research design
  - When important? When would you care about research methods? (imagine a future or past job)
  - Examples? (ask a friend, ask an expert, read a book, Google, wikipedia, etc.)
- What does empirical mean?
  - Based on observation

Lecture 1 - Introduction

2

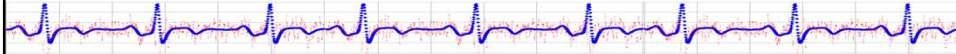
## Overview for Today

- Why we're here
- Overview of the Course
- Introductions
- Homework

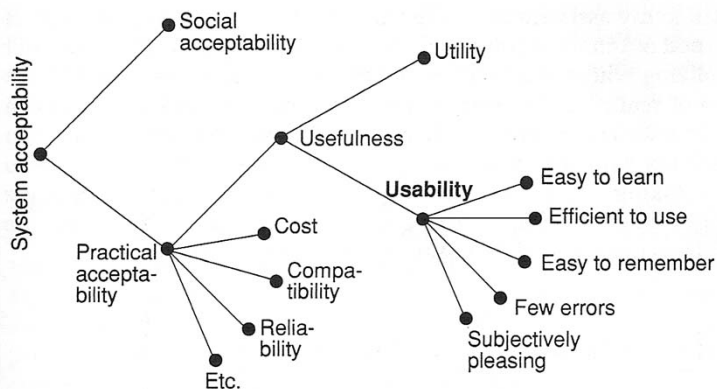
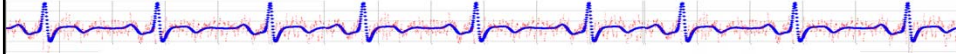
## Empirical Research

- Research is the process of increasing our knowledge
- Empirical research involves collection and analysis of data from observation
- *Contrast with analytical research*

# What are the roles of research methods in... Information Science? Health Informatics?



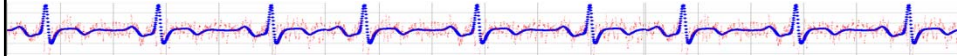
## Roles of Empirical Research in IS/PHI: evaluation



**Figure 1** A model of the attributes of system acceptability.

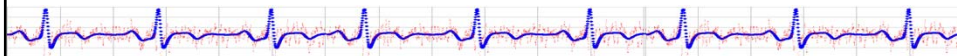
From Nielsen, *Usability Engineering*

## Empirical Research in IS/PHI: other roles

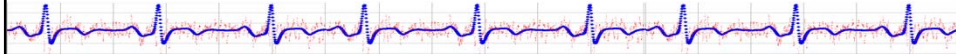


- Requirements analysis
- Assessing attitudes
  
- Any systematic collection and analysis of data to answer a research question

## Course Overview



## Overview of Course Content

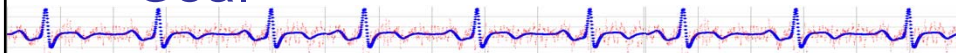


- Methods to help provide objective answers to questions about systems
  - Usability
  - Effectiveness
  - Acceptability
- and Impact on
  - Individuals, Work groups, Organizations and Society

Lecture 1 - Introduction

9

## Overview of Course Goal

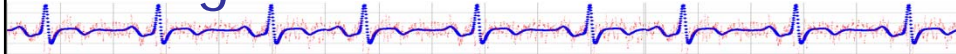


- IS: Prepare you for senior project
- PHI: Prepare you for project course
  
- Very hands-on
  - significant amount of fieldwork
- Lots of *practice* applying methods
- Review of *applied* statistics

Lecture 1 - Introduction

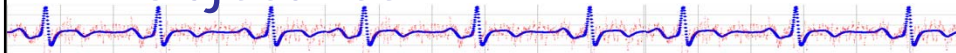
10

# Overview of Course Organization



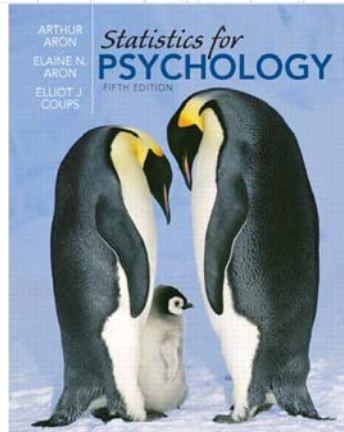
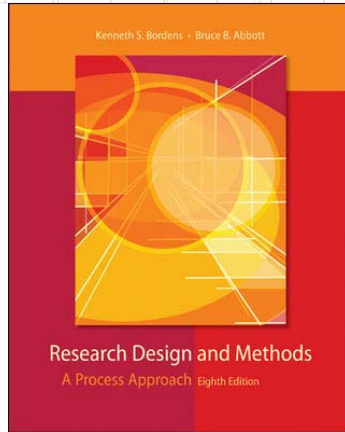
- first half – building a toolbox
  - basics of the scientific method, building bottom-up from a survey of objective measures to the fundamentals of hypothesis testing using relatively simple research designs.
- second half – applying it
  - alternates between team projects encompassing the design, conduct and presentation of small empirical studies and lectures covering more advanced research designs and statistical methods.

# Overview of Course Objectives



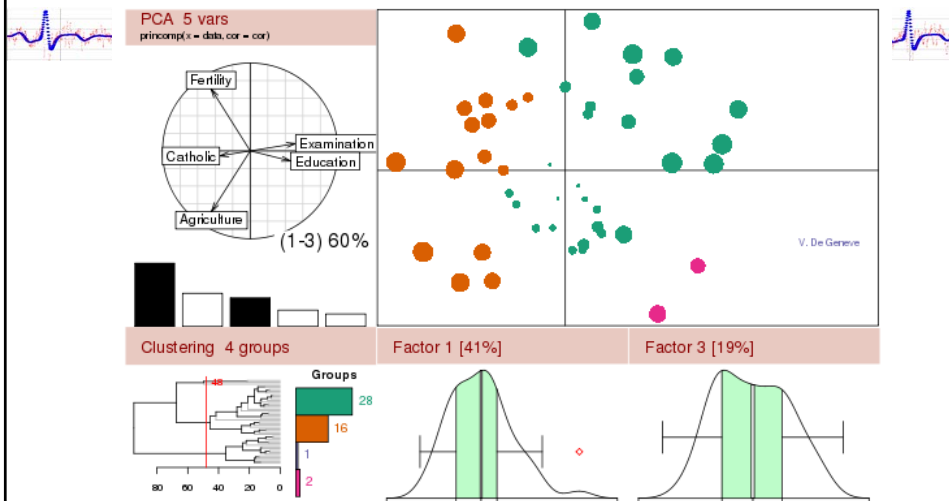
- Describe the scientific method and its advantages over other methods of inquiry.
- Understand and apply research methods that have been successfully used to evaluate information systems.
- Identify and clearly describe research questions which are answerable using empirical methods and whose answers are important and meaningful.
- Develop and document research models that can provide evidence to help answer one or more research questions, including appropriate measures, testable hypotheses, and statistical tests.
- Conduct fieldwork to collect data using a range of techniques, including: ethnography and other qualitative methods, system measurement, questionnaires, and behavioral measures.
- Characterize collected data using descriptive statistics.
- Provide evidence to confirm or refute hypotheses using inferential statistics.
- Document and present the results from empirical studies.
- Understand and describe the ethical issues in conducting studies involving human subjects.

# Course Materials



Lecture 1 - Introduction

# The R Project for Statistical Computing



Lecture 1 - Introduction

## Administrivia



- Course web site:  
[www.ccs.neu.edu/course/is4800](http://www.ccs.neu.edu/course/is4800)
- Instructor: Timothy Bickmore,  
[isu4800@ccs.neu.edu](mailto:isu4800@ccs.neu.edu)
  - Office hours W 3-5, WVH448
- TA/Grader: TBD
- Course-wide distribution list,  
[is4800-all@ccs.neu.edu](mailto:is4800-all@ccs.neu.edu)

Lecture 1 - Introduction

15

## Homework



- Email to [isu4800@ccs.neu.edu](mailto:isu4800@ccs.neu.edu) by noon on due date.
- Late = automatic full grade lowering

Lecture 1 - Introduction

16



## Quizzes

- At start of most classes.
- Closed book, 10 minutes (unless otherwise noted)
- Covers readings assigned for that class.

## Grades

- Quizzes (10%).
- Class participation (10%), including in-class presentations.
- Individual homework (20% divided equally among assignments).
- Team projects (20%, consisting of 15% project grade from the instructor and 5% peer evaluation).
- Midterm exam (20%).
- Final exam (20%).

## IS4800 – Empirical Research Methods in Information Science

[\[Syllabus\]](#)
[\[Schedule\]](#)
[\[Homework\]](#)
[\[Projects\]](#)
[\[Bibliography\]](#)
[\[Resources\]](#)
[\[Directory\]](#)
[\[Acks\]](#)

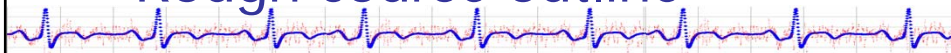
### Schedule

Date	Topics & Readings	Assignments	
		Due	Start
Lectures			
1/12	Introduction.		<a href="#">11</a>
1/15	The Scientific Method (B&A Ch 1). Doing background research (B&A Ch 3).	I1	<a href="#">12</a>
1/19	Human subjects research (B&A Ch 6 & 7).	I2	<a href="#">13</a>
1/22	Ethnography ( <a href="#">Fetterman</a> , <a href="#">Kindberg</a> , <a href="#">Swan</a> ).	I3	<a href="#">14</a>
1/20	Research models (B&A Ch 4).		<a href="#">15</a>
1/26	Objective measures (B&A Ch 5). Descriptive statistics (B&A Ch 13 to 403, Aron 76-80). SPSS16 Tutorial: Introduction & Using the Data Editor	I4,I5	<a href="#">16</a>

Lecture 1 - Introduction

19

## Rough course outline

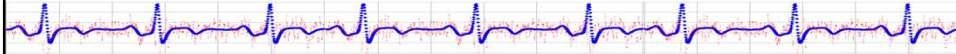


- Wk 1      Scientific Method, Literature
- Wk 2      Human Subjects, Ethnography
- Wk 3-5    Research Models, Measures
- Wk 6-n    Hypothesis testing, Exp designs,  
            Miscellany

Lecture 1 - Introduction

20

# Introductions



## My Background HCI

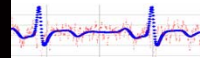


'95-'98

Lecture

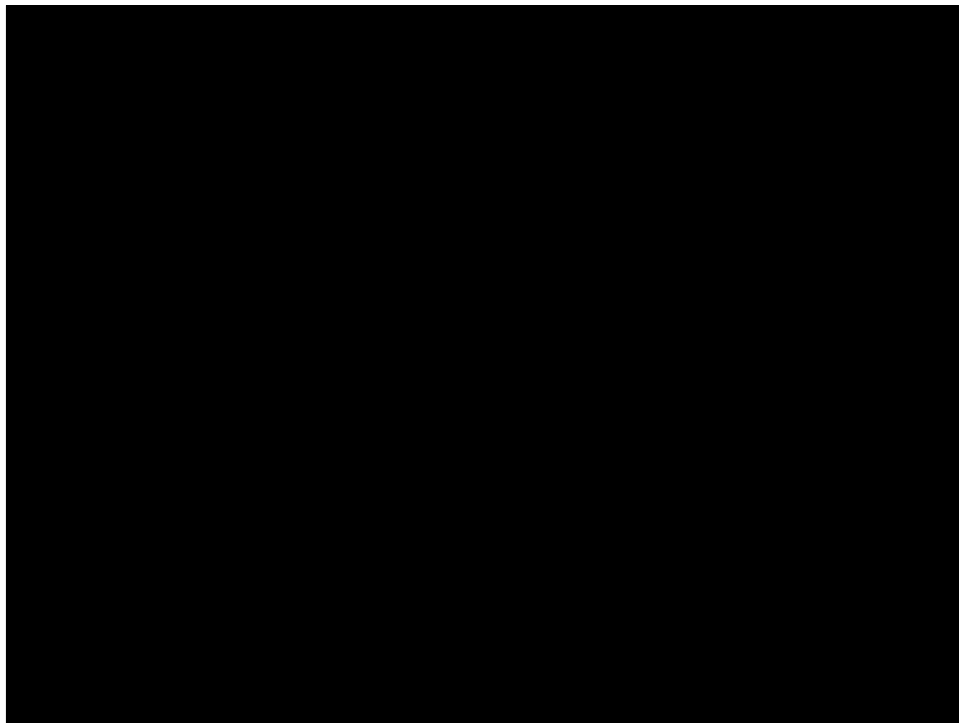


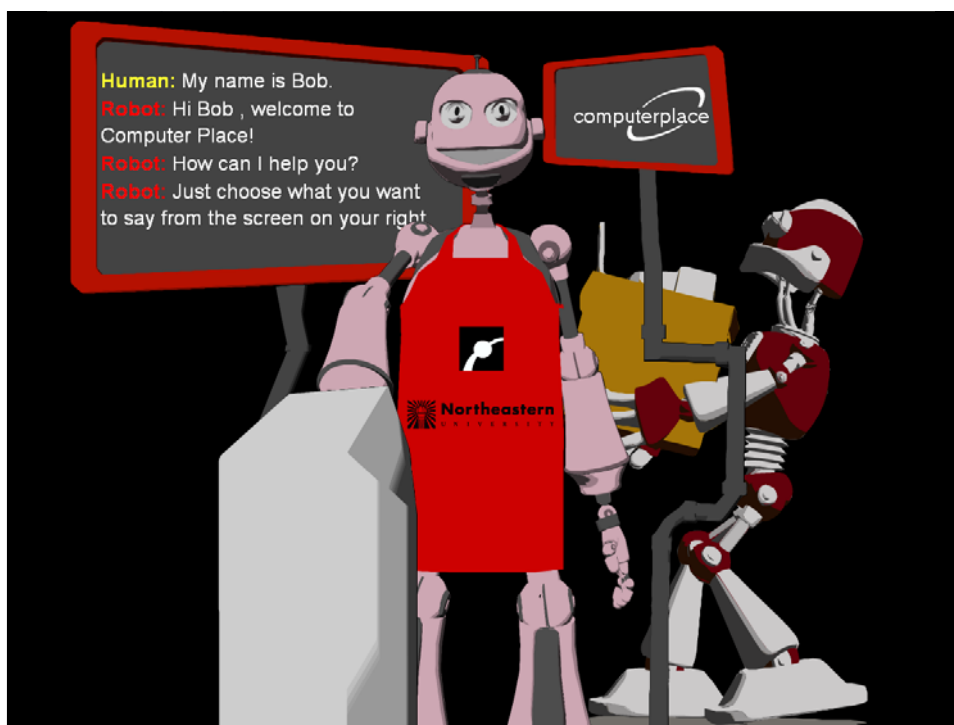
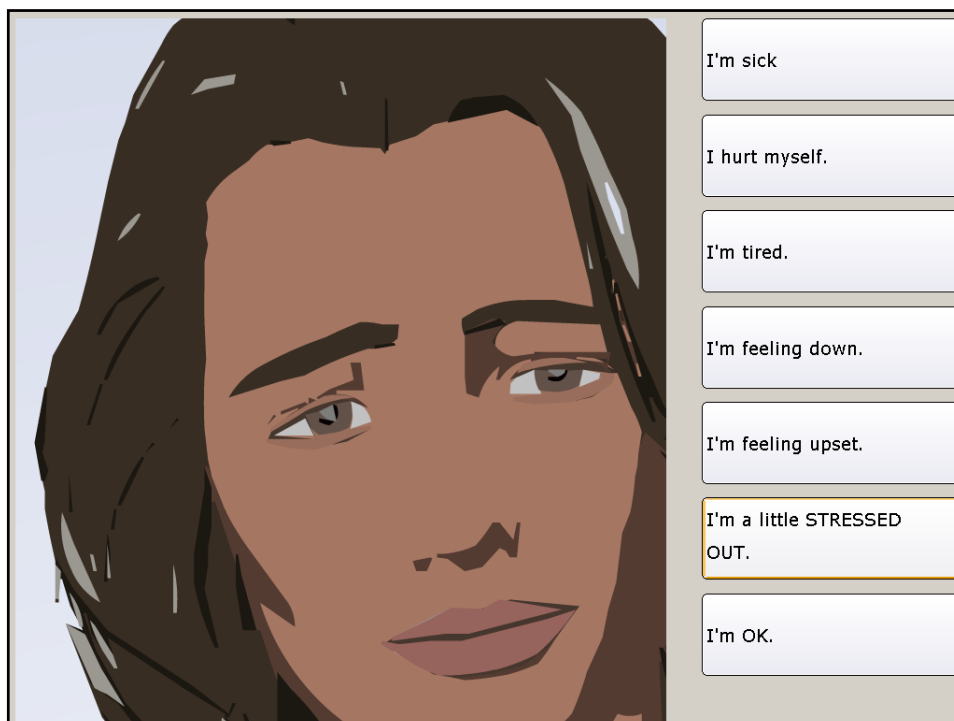
# Affective Computing



Lecture 1 -

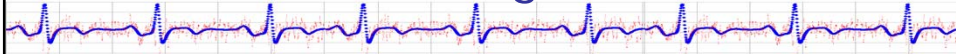
5







# Empirical Methods in Conversational Agent Research



## Posture Shifts

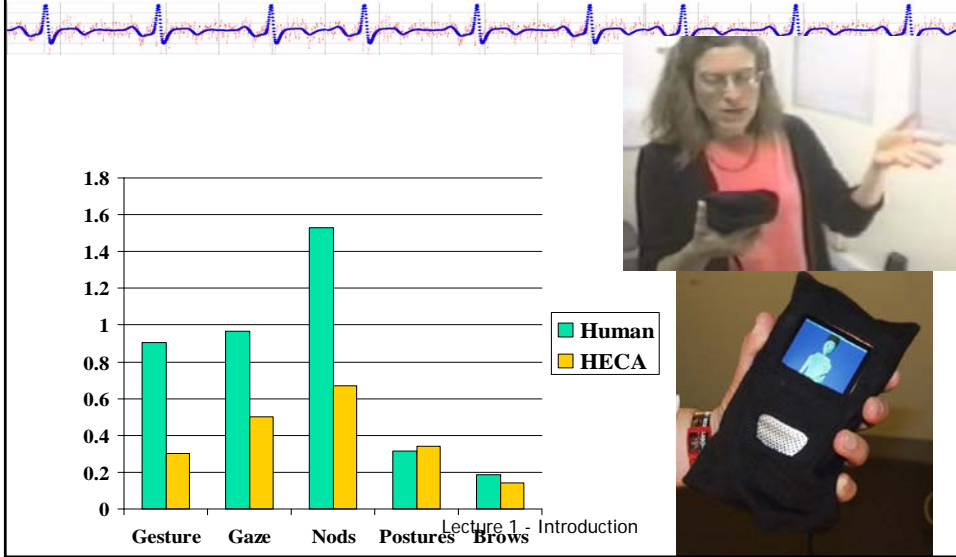


**Posture shifts with respect to discourse segment**

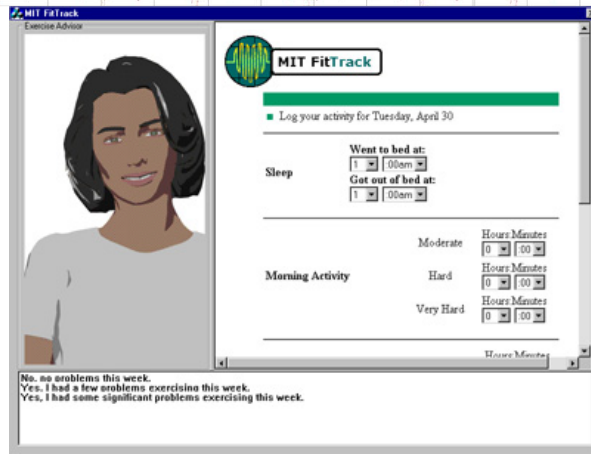
	Monologues (0.06/s)			Dialogues (0.07/s)		
	ps/s	ps/int	energy	ps/s	ps/int	energy
Inter-dseg	<u>0.340</u>	0.837	0.832	<u>0.332</u>	0.533	0.844
intra-dseg	<u>0.039</u>		0.701	<u>0.053</u>		0.723



# Handheld ECAs



# Intervention Efficacy Study: MIT FitTrack



Lecture 1 - Introduction

34

# MIT FitTrack Evaluation Study Objective

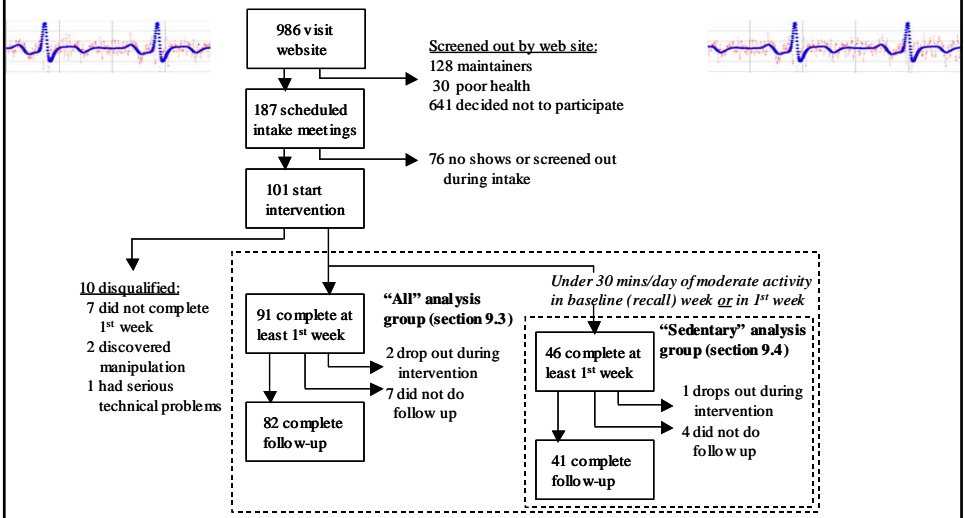
- Determine if
  - Agent can build a working alliance.
  - This translates into gains in behavior change.
- Behavior change objective
  - "30 minutes or more of moderate or better activity on most, if not all, days of the week" (recommend walking)
  - Secondary goal: 10,000 steps a day
- Between Subjects Design:
  - RELATIONAL – relational agent
  - NON-RELATIONAL – relational behaviors ablated
  - CONTROL – no agent

# Study Design

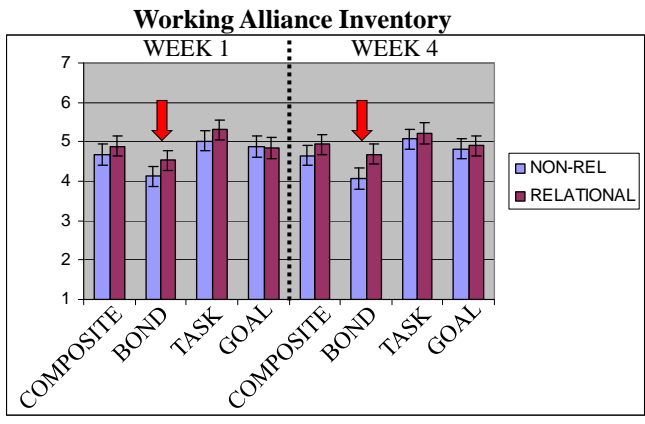
**Relational Measures:**  
**Hypotheses: NON-REL < REL**

	Baseline		Intervention				Two Week Break	Followup	Debrief
	Intake	1 <sup>st</sup> Login	2	7	27	29	30		
<b>CON-TROL</b>	/		/				/		/
<b>NON-REL</b>			WAI	WAI	Single items Farewell	/		Single items	
<b>REL</b>			WAI	WAI	Single items Farewell	/		Single items	

# Subjects

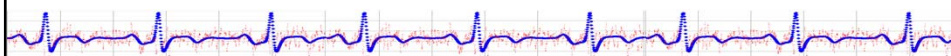


# Relational Results

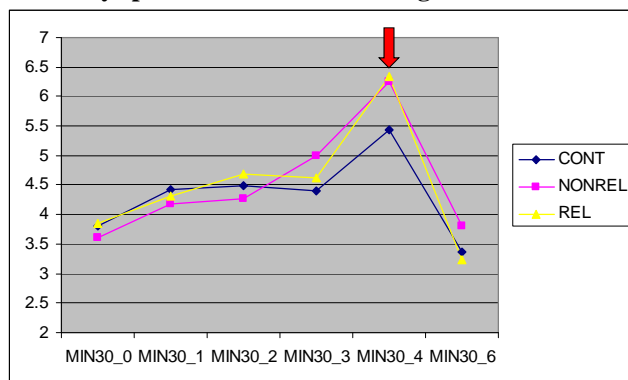


Differences in BOND subscales significant:  
 WK1 p<.05  
 WK4 p=.007

## Behavioral Results



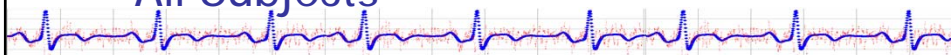
Days per week over 30 minute goal



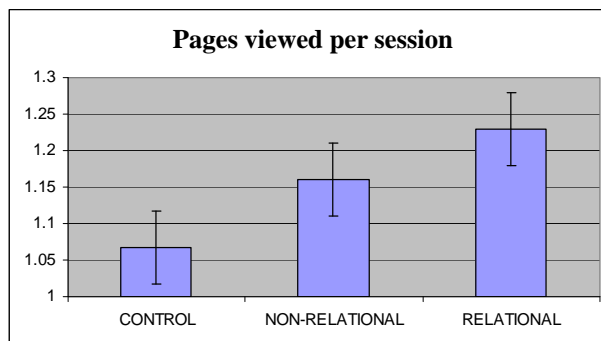
Only difference between groups is WK4, CONTROL < AGENT  $p=.06$

Significant increase WK0-WK4  $p<.001$   
Significant decrease WK4-WK6  $p<.001$

## Participation Results All Subjects

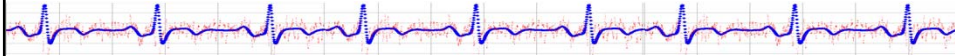


Pages viewed per session



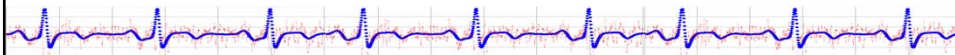
Significant difference in educational pages viewed: CONTROL < AGENT  $p<.05$

## Qualitative Analyses



- 28 interviews, 78 feedback messages

## Qualitative Analyses Repetitiveness



- Most frequent complaint

The first couple of days I was impressed by it. But, there didn't seem to be a lot of variety going on after that, so it kind of lost my interest, it lost the engagement factor. Maybe, six or seven days into the study I could almost predict what she was going to say, and once the engagement was lost you sort of lose the power of the animated instructor. ... (NON-RELATIONAL)

Like 15 days into the study when I could almost predict what she was going to say, it became easier to do things like check my mail in between her responses. ... Even with just little bits of variety your mind doesn't shut off. (NON-RELATIONAL)

In the beginning I was extremely motivated to do whatever Laura asked of me, because I thought that every response was a new response. Whereas, towards the end I could tell what she was going to say to a couple of my responses. (RELATIONAL)



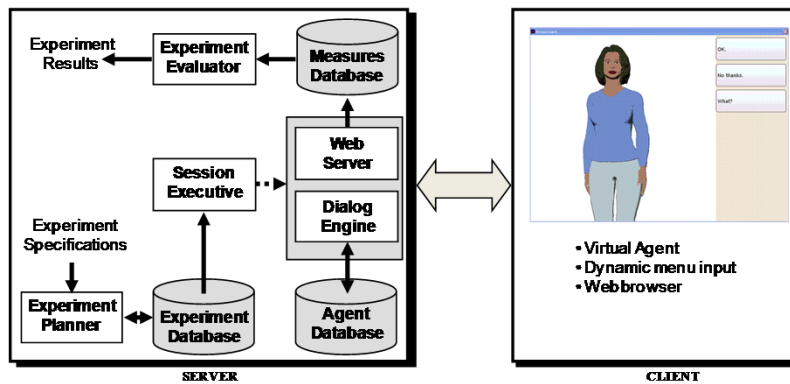
## Design Study

- How human should our agents be in “serious” application domains?
- Should they relate human backstories?

## Experiment

- Between-subjects, longitudinal design
- 1ST-PERSON vs. 3RD-PERSON
- **H1 (engagement):** Participants in the 1<sup>st</sup>-person condition will use the system significantly more than those in the 3<sup>rd</sup>-person condition.
- **H2 (engagement):** Participants in the 1<sup>st</sup>-person condition will report greater enjoyment of the stories and greater engagement with the agent than those in the 3<sup>rd</sup>-person condition.
- **H3 (deceit):** Participants in the 1<sup>st</sup>-person condition will report greater perceived dishonesty by the agent than those in the 3<sup>rd</sup>-person condition.

## NSF Virtual Laboratory



45

## Virtual Lab Status

- Running continuously over the last year
- Total of 47 study participants aged 55 or older
  - 81% female
  - age 54-67
  - paid \$1 per login
- Conducted over 4,000 conversations

46

## Manipulation

### 1ST-PERSON

I'd like to tell you some stories about myself.

I'm not quite sure if I told you about this before.

When my family was living in Falmouth, my parents always had us doing outdoor stuff.

So especially when it was nice out I would go biking or hiking or we would just go for a walk and have a picnic, things like that.

### 3RD-PERSON

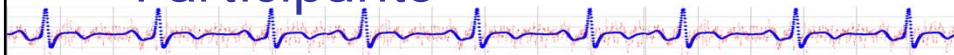
I'd like to tell you some stories about a friend of mine. She's an exercise counselor too.

I'm not quite sure if I told you about this before.

When her family was living in Falmouth, her parents always had them doing outdoor stuff.

So especially when it was nice out she would go biking or hiking or they would just go for a walk and have a picnic, things like that.

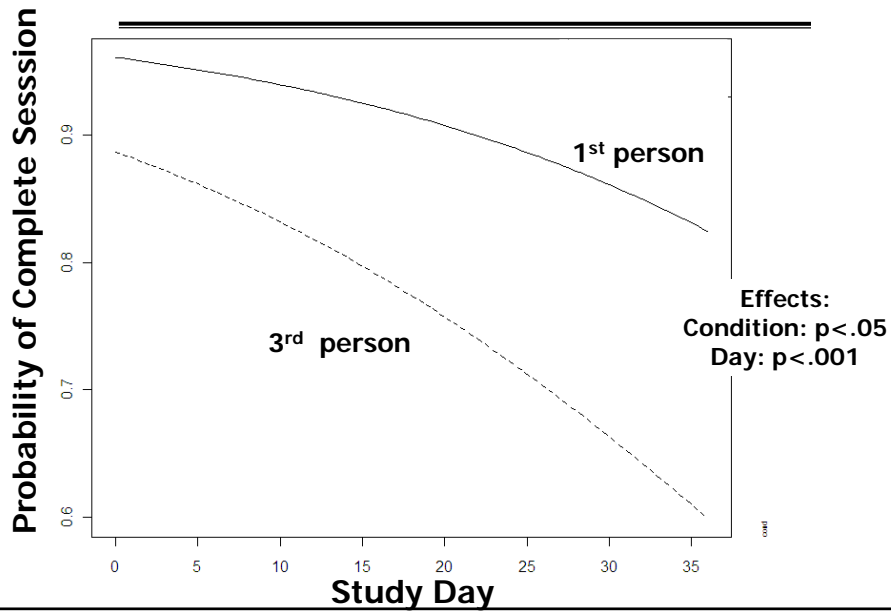
## Participants



- 26 participants (21 female, 5 male, aged 54-67)
- Well-educated (92% some college)
- Computer literate (12% computer "experts", 88% use computers regularly)
- Positive attitudes towards computers (64% said they enjoyed working with computers)
- 15 continuing participants; 11 were newly recruited
  - NOTE: No differences in results for these two groups
- Duration: 5 to 37 days (mean 28.8 days).



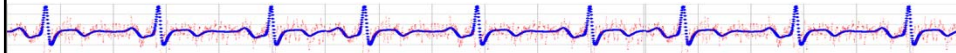
## Results: Engagement



## Introductions

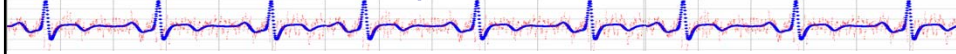
- Name
- Your background
- Describe a research study you might have done (or did do) in a past job.

## Exercise



What are some questions that might arise in a corporate IS environment that can be answered using empirical research methods?

## Homework, etc.



- Read B&A Ch 1 & 3
- Do Homework 1 (not graded)
  - Read through course website
  - Find & do homework 1