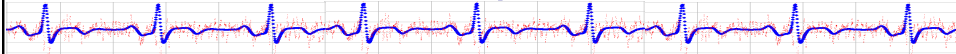


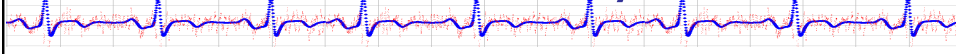
Empirical Research Methods [in Information Science]

IS4800 / CS6350



Prof. Timothy Bickmore

Overview for Today



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

Empirical Research

- Research is the process of increasing our knowledge
- Research methods are the tools and techniques considered valid by a given research community
- Empirical research involves collection and analysis of data from observation
- *Contrast with analytical research*

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Epistemology

- Positivism
 - The only authentic knowledge is that gained through positive affirmation of theories following the strict scientific method.
- Empiricism
 - Observational evidence is indispensable for knowledge of the world.
- Rationalism
 - Knowledge can only be inferred through sound logical reasoning and "self evident truths".

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Our focus: Logical empiricism

- Combines empiricism with rationalism
- Only scientific, mathematical, and logical statements are literally meaningful, or have truth values.

What are the roles of research methods in...

Information Science?

Health Informatics?

Roles of Empirical Research in IS/ PHI: evaluation

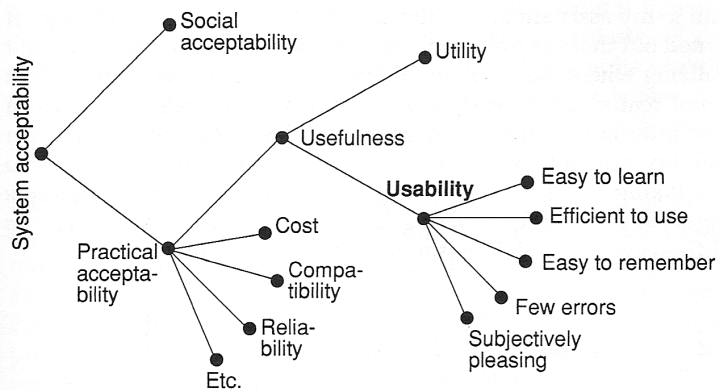


Figure 1 A model of the attributes of system acceptability.

From Nielsen, *Usability Engineering*

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Empirical Research in IS/PHI: other roles

- Requirements analysis
- Assessing attitudes

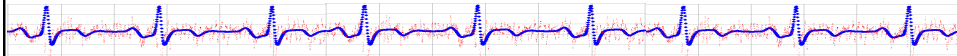
- Any systematic collection and analysis of data to answer a research question

- Essential for
 - Conducting research
 - Consuming research

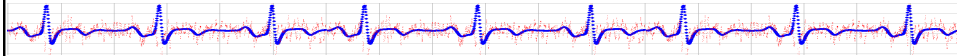
Lecture 1 - Introduction

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Course Overview

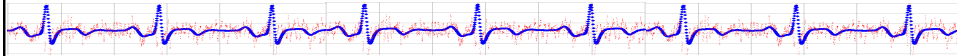


Overview of Course Content



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

Overview of Course Goal

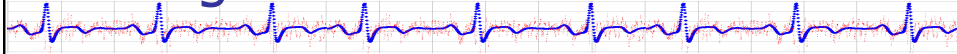


- IS: Prepare you for senior project
- PHI: Prepare you for project course
- CS: Enable HCI evaluation

- Very hands-on
 - significant amount of fieldwork
- Lots of *practice* applying methods
- Review of *applied* statistics

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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.

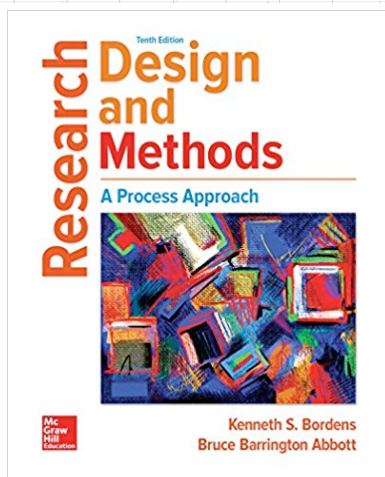
Lecture 1 - Introduction

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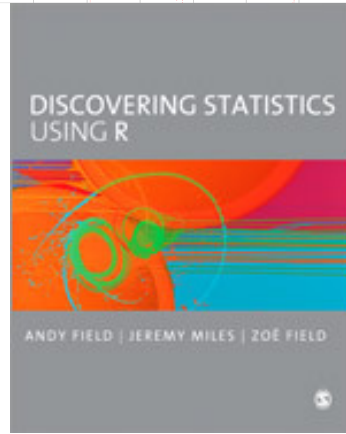
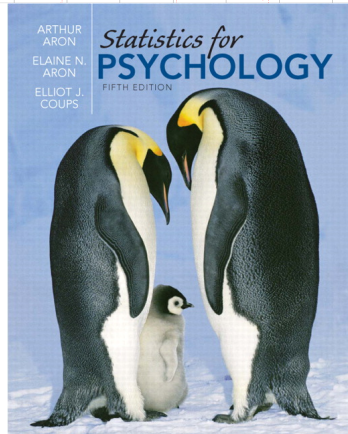
Overview of Course Objectives

- Scientific method.
- Research methods used in IS/PHI/HCI.
- Identify research questions which are answerable using empirical methods.
- Research models, including measures, hypotheses, and statistical tests.
- Fieldwork to collect data using a range of techniques.
- Descriptive statistics.
- Inferential statistics.
- Document and present results from empirical studies.
- Ethical issues in human subjects studies.

Course Materials

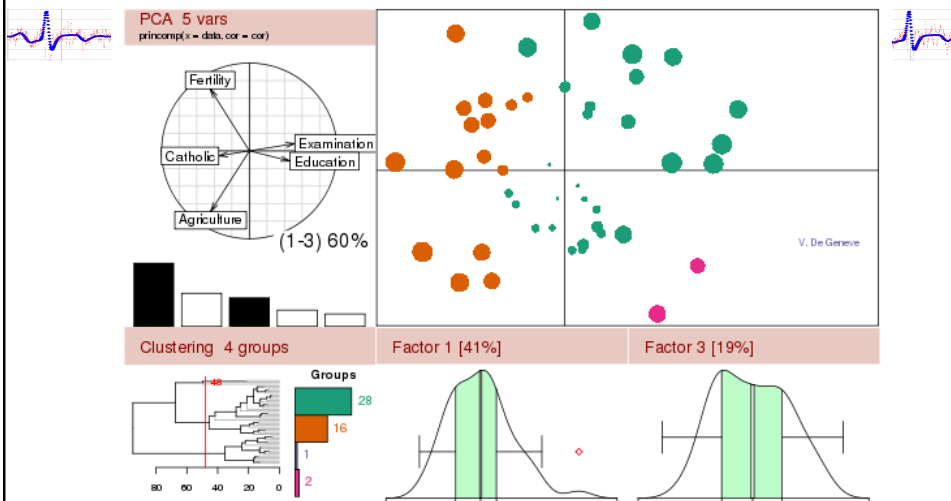


Optional



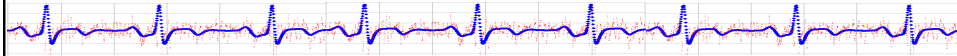
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The R Project for Statistical Computing



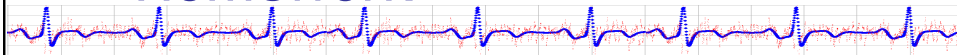
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Administrivia



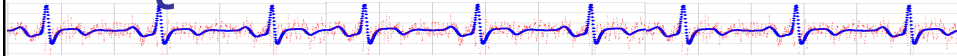
- Course web site:
www.ccs.neu.edu/course/is4800sp18
- Instructor: Timothy Bickmore,
is4800@ccs.neu.edu
- Course-wide distribution list (grads & ugrads)
is4800-all@ccs.neu.edu
- Grads only distribution list
cs6350@ccs.neu.edu

Homework



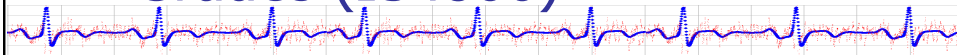
- Email to is4800@ccs.neu.edu by noon on due date.
- Late = automatic full grade lowering

Quizzes



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

Grades (IS4800)



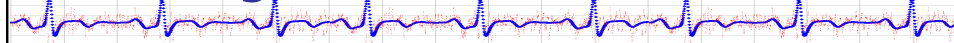
- Quizzes (10%).
- Class participation (10%), including in-class presentations.
- Individual homework (20% divided equally among assignments).
- Team projects (20%, consisting of 15% project grade from the instructor and 5% peer evaluation).
- Midterm exam (20%).
- Final exam (20%).

Schedule

Date	Topics & Readings	Assignments	
		Due	Start
1/9	Introduction.		I1
1/12	The Scientific Method (B&A Ch 1). Doing background research (B&A Ch 3, 67-95). Sample research plan .	I1	
1/16	Human subjects research (B&A Ch 6 & 7, NU IRB Policy).		
1/19	Ethnography (B&A pp 241-247, Fetterman, Klasnja, Chen). R: Introduction		I2a
1/23	Research models (B&A Ch 4). R: Data manipulation and plotting		I2b
1/26	Objective measures (B&A Ch 5). Descriptive statistics (B&A Ch 13 to 412). R: Descriptive statistics.		
1/30	Information system measures (Nielsen Ch 6, Sensing Techniques for Mobile Interaction, Usability Study of Physicians).	I2	I3
2/2	Qualitative methods. Usability studies.		
2/6	Qualitative methods. Usability studies.		

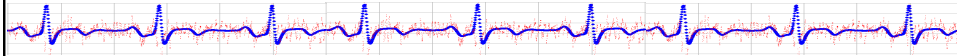
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Rough course outline



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

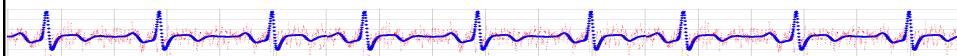
CCIS Policies



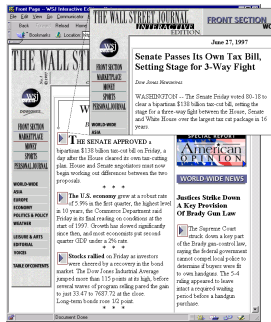
- No makeup or alternate exams
 - Midterm (3/2) and Final (4/20-27)

- No cheating
 - If there is ANY suspicion you WILL be referred to NU and CCIS ethics committees

Introductions



My Background HCI

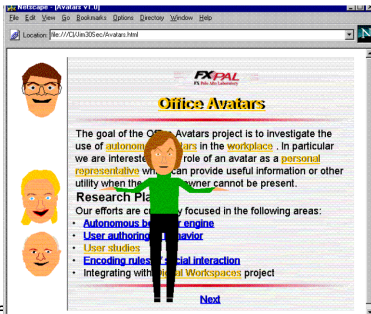
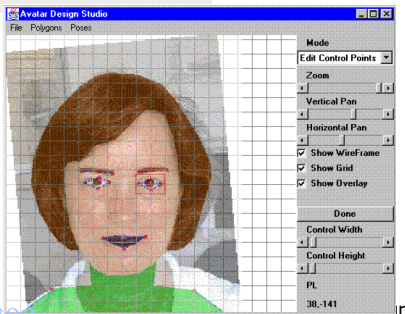


WSJ CPD
 INDEX
 THE SENATE APPROVED
 The U.S. economy gr
 OK NEXT Phone

 WSJ CPD
 Front Page - WSJ
 Interactive Edition
 Friday, June 27, 1997
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 WSJ CPD
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 The Wall Street
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 WSJ CPD
 Senate Passes Its
 Own Tax Bill,
 Setting Stage for
 LINKS NEXT Phone



'95-'98

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Affective Computing




A woman wearing a black visor and sunglasses, likely used for eye-tracking or gaze analysis research.



A hand wearing a purple sensor device, possibly for heart rate or skin temperature monitoring. A small red light is visible on the device. To the right, a portion of a blue and red waveform graph is visible.




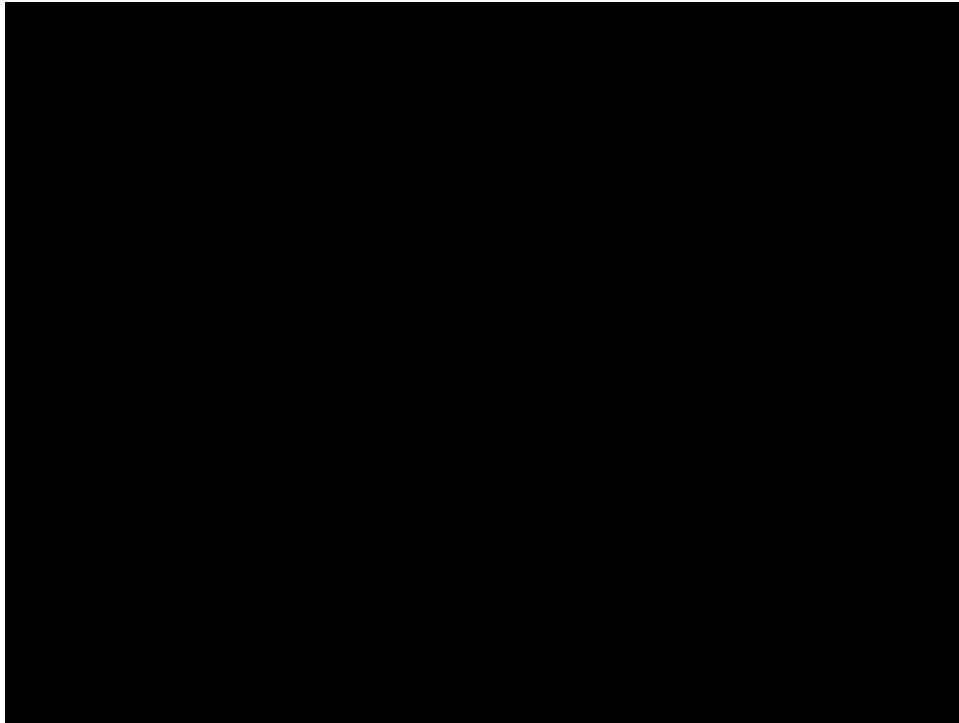
A black and white photograph of a smiling woman, likely a researcher or participant in the field.



A close-up of an ear with a small, red and black sensor attached to the earlobe, used for physiological data collection.

Lecture 1 -

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I'm sick

I hurt myself.

I'm tired.

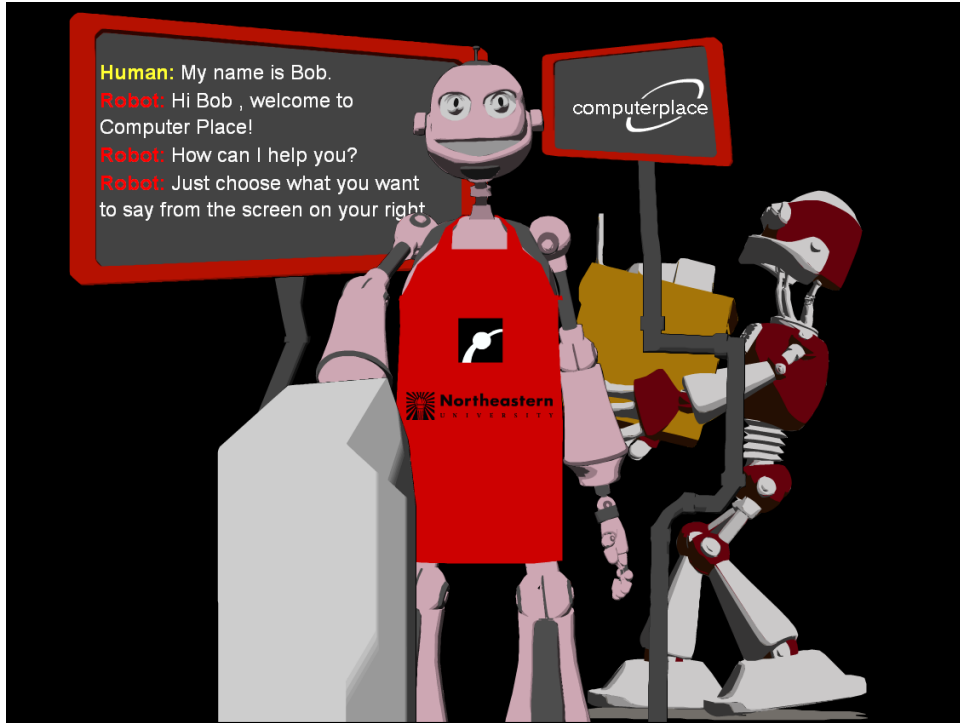
I'm feeling down.

I'm feeling upset.

I'm a little **STRESSED OUT.**

I'm OK.

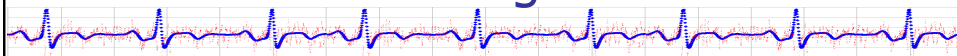
A stylized illustration of a person's face with long dark hair, looking slightly to the left. To the right of the face is a vertical list of seven buttons, each containing a different statement. The button with the text "I'm a little STRESSED OUT." is highlighted with a yellow border.



relationalagents.com



Empirical Methods in Conversational Agent Research



Posture Shifts



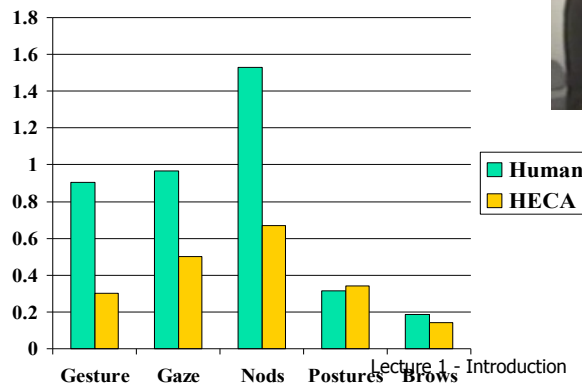
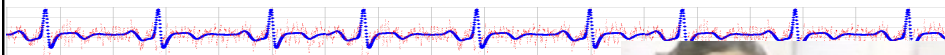
Posture shifts with respect to discourse segment

	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

Lecture 1 - Introduction

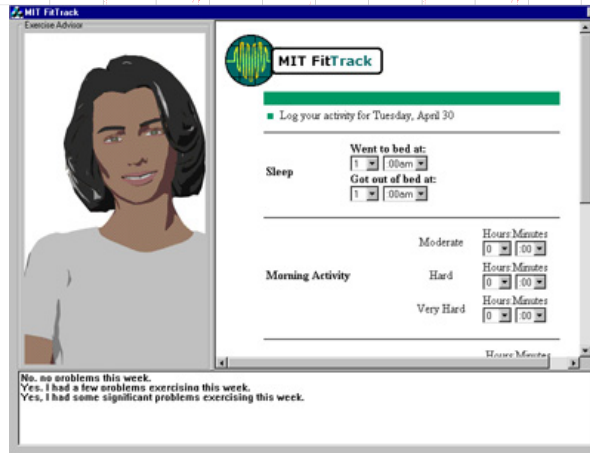
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Handheld ECAs



Lecture 1 - Introduction

Intervention Efficacy Study: MIT FitTrack



Lecture 1 - Introduction

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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

Lecture 1 - Introduction

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Study Design

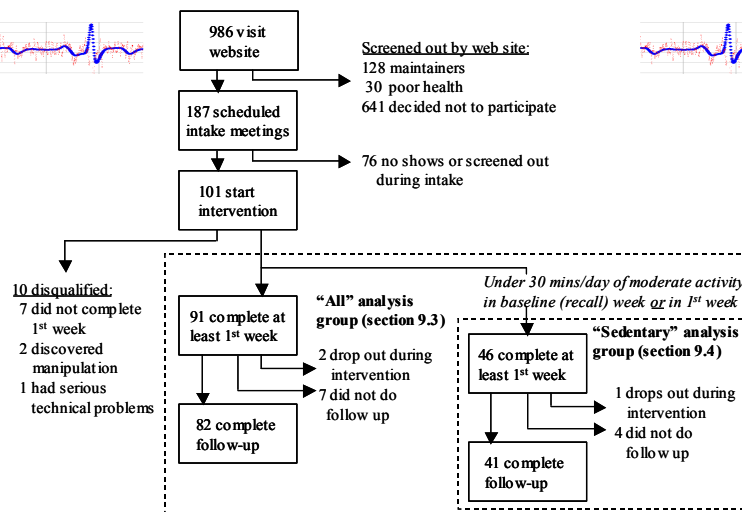
Relational Measures:
Hypotheses: NON-REL < REL

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

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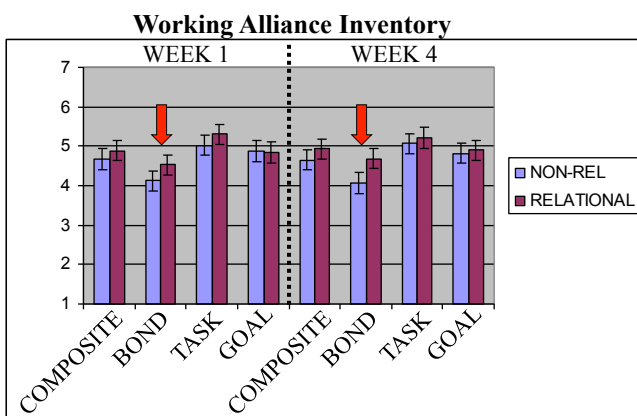
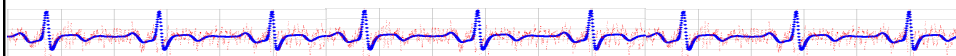
Subjects



Lecture 1 - Introduction

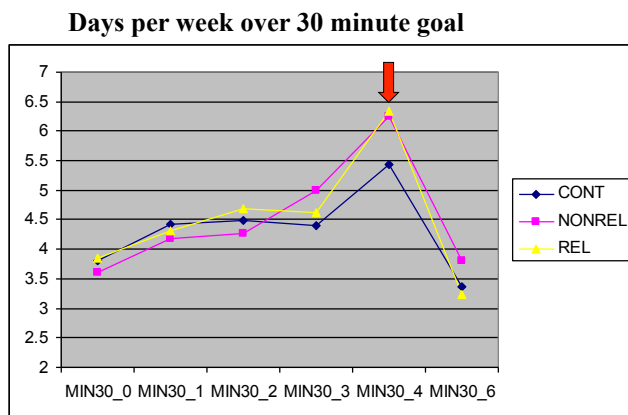
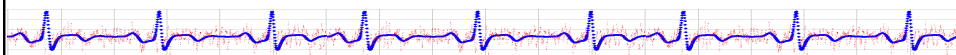
41

Relational Results



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

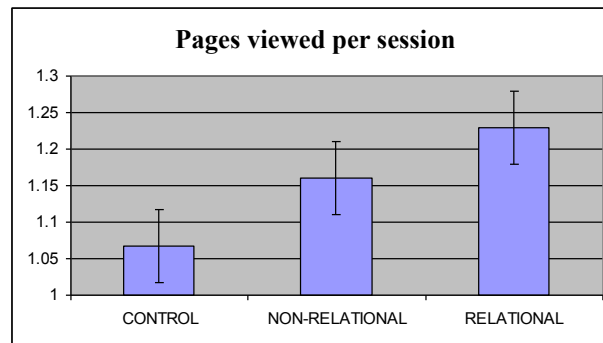
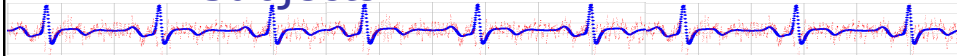
Behavioral Results



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

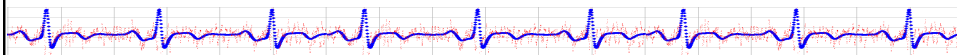


Significant difference
in educational pages
viewed:
CONTROL < AGENT
 $p < .05$

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Qualitative Analyses

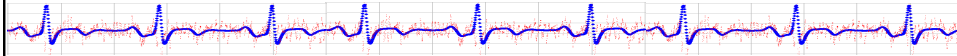


- 28 interviews, 78 feedback messages

Lecture 1 - Introduction

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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)

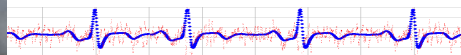
In the beginning I was extremely motivated to do whatever Laura asked of me, because I thought that every response was a new response. Whereas, towards the end I could tell what she was going to say to a couple of my responses. (RELATIONAL)

Lecture 1 - Introduction

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Design Study

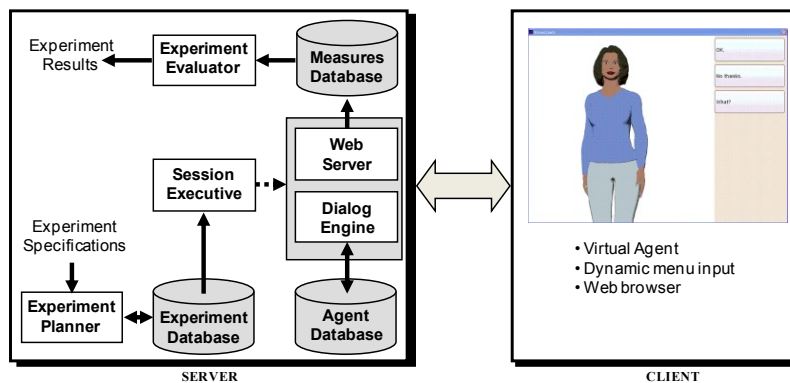


- How human should our agents be in "serious" application domains?
- Should they relate human backstories?

Experiment

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

NSF Virtual Laboratory



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

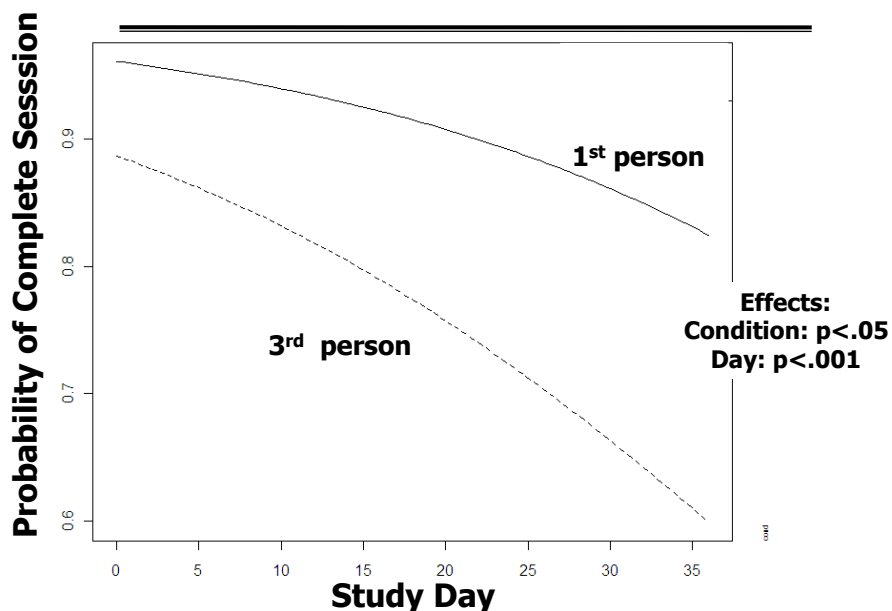
I'd like to tell you some stories about a friend of mine. She's an exercise counselor too.

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

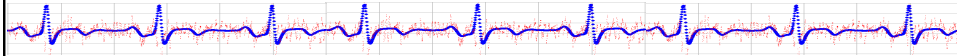
When her family was living in Falmouth, her parents always had them doing outdoor stuff.

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.

Results: Engagement



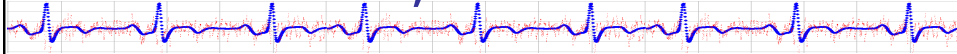
Introductions



- Name
- Your background

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

Homework, etc.



- Read B&A Ch 1 & 3 (67-100)
- Read sample research plan
- Do Homework 1 (not graded)
 - Read through course website
 - Find & do homework 1