


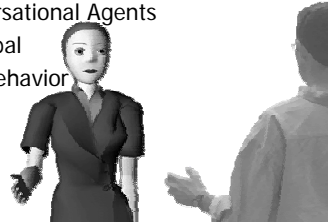

Relational Agents for Health Behavior Change

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Gesture & Narrative Language Group, Prof. Justine Cassell


- Study & emulate human face-to-face conversation
- Embodied Conversational Agents
- Focus on nonverbal communicative behavior
 - gaze, posture, gesture, etc.


Embodied Conversational Agents




REA




LAURA



MACK






LEARNING COMPANION



Affective Computing Group *Prof. Rosalind Picard*



- Computing that relates to, arises from, or deliberately influences emotions.
- Focus on detection of emotional state via mobile / wearable sensors.

Management of User Emotional State

- Computer interfaces that actively support human users in their ability to regulate, manage, and recover from their own negative emotional states.
- Experiment:
 - Intentionally frustrated users
 - When computer elicited user's emotional state and offered empathetic feedback users continued to work with it significantly longer.


Relational Agents

Computational artifacts designed to build and maintain long-term, social-emotional relationships with their users.




How do people benefit from social relationships?

- Direct benefits
 - Instrumental, emotional support
- Indirect benefits
 - Persuasion (e.g., sales)
 - Educational gains
 - Health & Well-being
 - Helping (e.g., psychotherapy, behavior change)


Previous Work: Computers As Social Actors studies

- Liking
 - Flattery
 - Use of praise for others
 - Similarity attraction
 - Teaming
 - Humor
- Attraction / Cooperation
 - Reciprocal deepening self-disclosure






Commercial Products

- Fulfill need for nurturance
- “unique” behavior
- Persistence







Shortcomings in Previous Work

- No longitudinal studies
- Little or no persistence
- No effects on task outcome

Relational Agents Implemented



	REA 	Laura 
Focus	Face-to-face conversation	Long-term relationship
Relational model	Dimensional (familiarity, solidarity)	Time Common ground
Planning	Activation network	Augmented transition networks
Relational behavior	Small talk	Maintenance
Task Domain	Real estate	Exercise adoption
Evaluation	Trust	Working Alliance



Working Alliance

- Trust and belief that a helper and client have in each other as team-members in achieving a desired outcome.
- Strong effect on outcomes across wide range of psychotherapeutic disciplines.
- Subscales: bond, task, goal

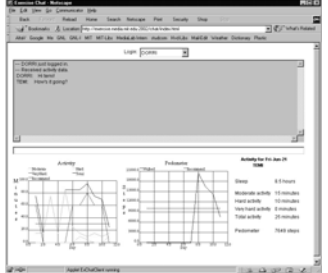

Agent: Exercise "Advisor"

- Not a personal trainer
- Uses 'I' rather than 'this computer'
- Can express empathy, but
- Does not have feelings
- No personal 'backstory'
 - Describes 3rd person experiences ("One of my clients always packs her gym clothes...")

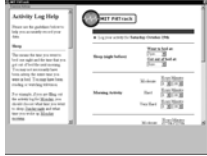
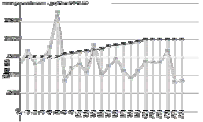
Design Studies

- 5 face-to-face Meetings
- 5 x 2 week daily chats
- Series of surveys on agent design.

Typical Daily Interaction

- Fill out activity logs
- View self-monitoring charts
- Fill out surveys
- Discussion with agent
 - Greeting
 - Find out physical & emotional state
 - Follow up
 - Give tips
 - Get commitment
 - Farewell
- Educational content

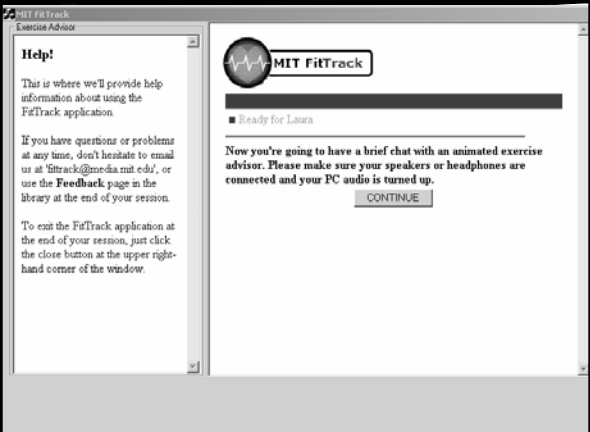



Behavior Change Strategies

- Via Forms and Content Pages
 - Goal setting
 - Shaping
 - Self-monitoring
 - Education
 - Decisional Balance (weighing pros and cons)
- Via Agent
 - More detailed goal setting (commitments)
 - Positive reinforcement
 - Obstacle avoidance / Performatives / Relapse prevention / Coping thoughts / Social proof

Relational Strategies

- Small talk
- Emotional Support
 - Empathy exchanges (following Klein)
- Increasing common ground
- Continuity behaviors
- Meta-relational communication
- Humor
- Politeness & Forms of Address
- Reciprocal self-disclosure
- Performing routine behaviors together
- Nonverbal Immediacy behaviors

MIT FitTrack
Exercise Advisor

Help!

This is where we'll provide help information about using the FitTrack application.

If you have questions or problems at any time, don't hesitate to email us at fittrack@media.mit.edu, or use the **Feedback** page in the library at the end of your session.

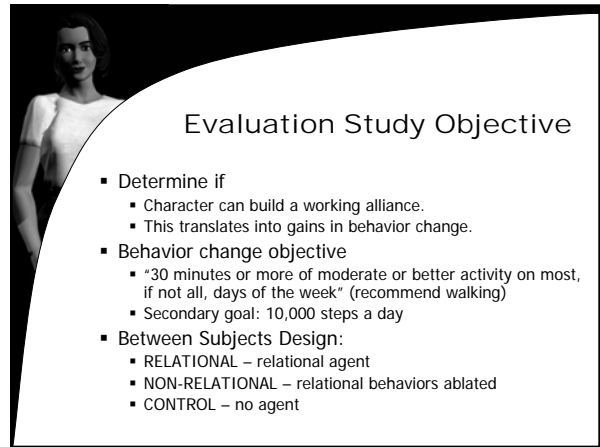
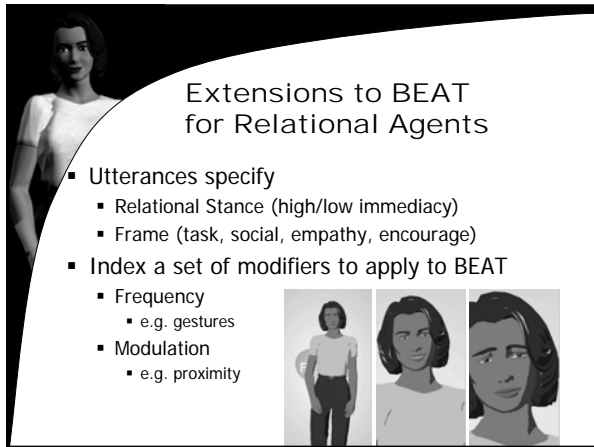
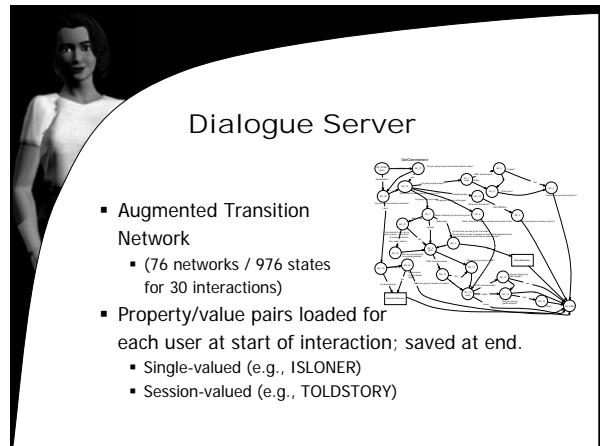
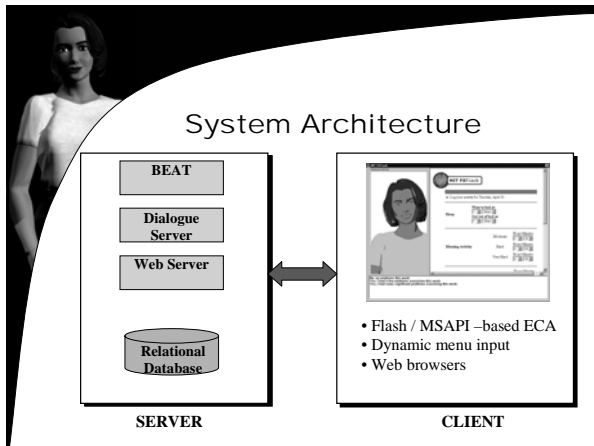
To exit the FitTrack application at the end of your session, just click the close button at the upper right-hand corner of the window.

MIT FitTrack

Ready for Laura

New you're going to have a brief chat with an animated exercise advisor. Please make sure your speakers or headphones are connected and your PC audio is turned up.

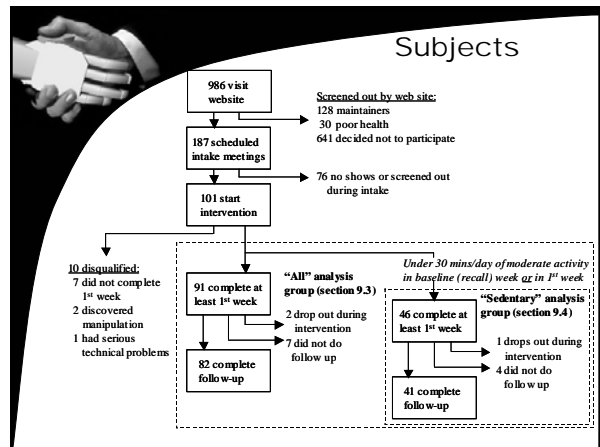
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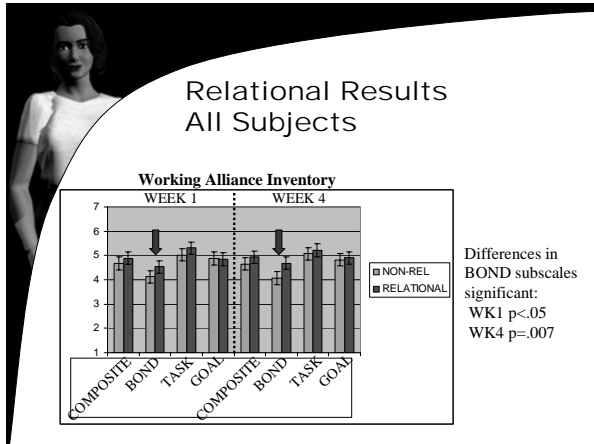


Relational Measures

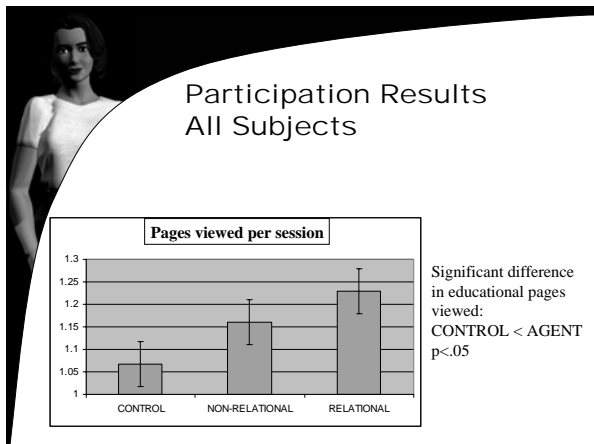
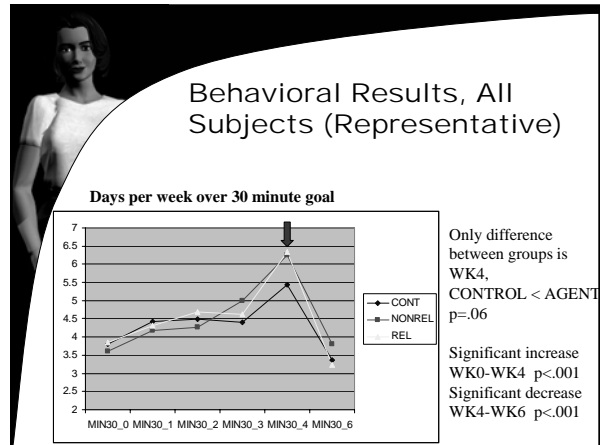
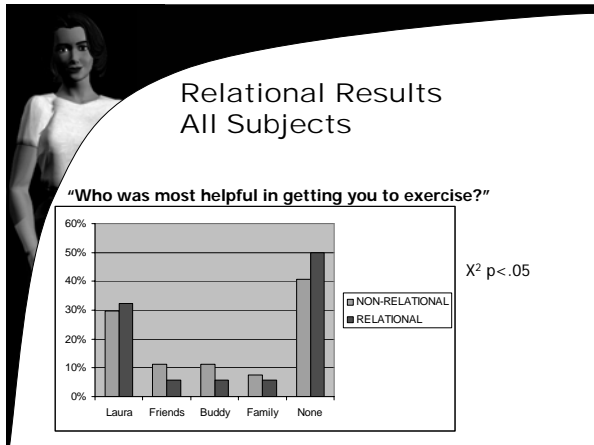
Hypotheses: NON-REL < REL

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

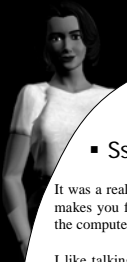




- ### Relational Results All Subjects
- Single items:
 - "How much do you like Laura?" $p < .05$
 - "How would you characterize your relationship with Laura?" $p < .05$
 - "Would you like to continue working with Laura?" (at end of WK4) $p < .05$
 - Behavioral measure:
 - Sentimental farewell (70% REL vs. 32% NON-REL; $p < .001$)



- ### Qualitative Analyses
- 28 interviews, 78 feedback messages
 - Overall Impressions...
 - I guess I thought...it's a really really good idea, and some aspects of it were very helpful, like being able to record your progress and things like that. (RELATIONAL)
 - It was useful. It was my number one motivation for working out. It was a consistent motivation for working out. (NON-RELATIONAL)
 - It was really good. I was exercising much more than before. (RELATIONAL)



Qualitative Analyses Acceptance of Laura


- Ss weighed in on both sides..

It was a really, really great idea to have some kind of animated character because it makes you feel like you're actually talking to a person rather than having words on the computer screen. (NON-RELATIONAL)

I like talking to Laura, especially those little conversations about school, weather, interests, etc. She's very caring. Toward the end, I found myself looking forward to these fresh chats that pop up every now and then. They make Laura so much more like a real person. (RELATIONAL)

I didn't really like Laura very much. ... Actually, I liked all of the software except for the animated conversation thing. (RELATIONAL)


Personally I detested Laura. (NON-RELATIONAL)



Qualitative Analyses vs. Human Trainer

No, not given my time constraints. With respect to a webcam and a live trainer, that would be a toss up, but I don't think you could get one to be available at 11pm. (NON-RELATIONAL)

Probably not. More painful that way, if I decide not to do something. I've interacted with live people before and given up on them because of exercise. Because sometimes I want to go off the wagon for awhile on exercise. And, when talking with a computer program about exercise, I never want to avoid that person in real life if I haven't made my exercise goal. So, I kind of liked the fact that she was a computer program and not a person. (RELATIONAL)



Qualitative Analyses Laura as Motivator


- Most felt responsible to her

When I said I couldn't exercise I felt bad. When she said "are you sure you can't exercise?" it would make me think about it. (NON-RELATIONAL)

It sort of kept me motivated, because I always do more if I know I'm responsible to someone. (RELATIONAL)

It kept you on your toes because you didn't know if you were going to meet with the animated person. (RELATIONAL)

As silly as it sounds, I find that I found a little motivation to exercise knowing that Laura would ask if I did or not. Now that I don't have anyone checking, I find it harder to get motivated. (RELATIONAL)



Study Conclusions

- Demonstrated ability of relational agents to build caring, trusting relationships with users
 - "Laura and I trust one another." ($p < .001$)
 - "I believe Laura is genuinely concerned about my welfare." ($p < .001$)
 - "My relationship with Laura is very important to me." ($p < .05$)
 - "I feel Laura cares about me..." ($p < .001$)
 - "Laura and I respect each other." ($p < .001$)
 - "I feel Laura appreciates me." ($p = .009$)
 - "I believe Laura likes me." ($p < .001$)
 - Reported liking of Laura. ($p = .007$)
 - Reported desire to continue working with Laura. ($p = .001$)
- Demonstrated the efficacy of having an animated exercise advisor who set and followed up on goals.



Future Work

- Relational agents to address social isolation & depression in elder-care
 - DOM Pilot Project with Geriatrics
- Kiosk-based health education
- PDA-based health behavior interventions
- Long term social interaction with agents
- Dialogue planning for treatment negotiation





Conclusion

- "Patient centered computing" is important for patient satisfaction and health outcomes
- More info
 - bickmore@bu.edu
 - <http://www.misu.bmc.org/~bickmore/>