Enabling Web Search for Low Health Literacy Individuals Using Conversational Agents

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Barriers to Participation in Clinical Trials

- 85% of cancer patients are unaware that there are clinical trials they could participate in
- 77% of patients who participate in a trial learned about it from their health care provider

- 34% of clinical trials recruited less than 75% of their planned sample

Objective: Increase Participation in Clinical Trials by Disadvantaged Populations

- Several web-based search engines available.
  - National Cancer Institute
  - ClinicalTrials.gov
  - Etc

Search for Clinical Trials

Clinical Trial Questions?
Get Help:
1-800-4-CANCER
LiveHelp online chat

Video Guide:
How to Use the NCI Clinical Trials Search Form

Popular Resources

- Help Using the NCI Clinical Trials Search Form
- Learn About Clinical Trials
- About NCI's List of Cancer Clinical Trials
- NCI Dictionary of Cancer Terms
- NCI Drug Dictionary

Search NCI's list of 8,000+ clinical trials now accepting participants, or use more search options to search the set of 19,000+ clinical trials that are no longer recruiting.

Search Tip: Skip any items that are unknown or not applicable.

Cancer Type/Condition Colon cancer

Stage/Subtype

- [ ] All
- [ ] stage 0 colon cancer
- [ ] stage I colon cancer
- [x] stage II colon cancer
- [ ] stage IIA colon cancer
- [ ] stage IIB colon cancer

Location

- (•) Near ZIP Code
- ( ) At Hospital/Institution
- ( ) In City/State/Country
- ( ) At NIH

Near ZIP Code

Show trials located within: 100 miles of ZIP Code: 02115

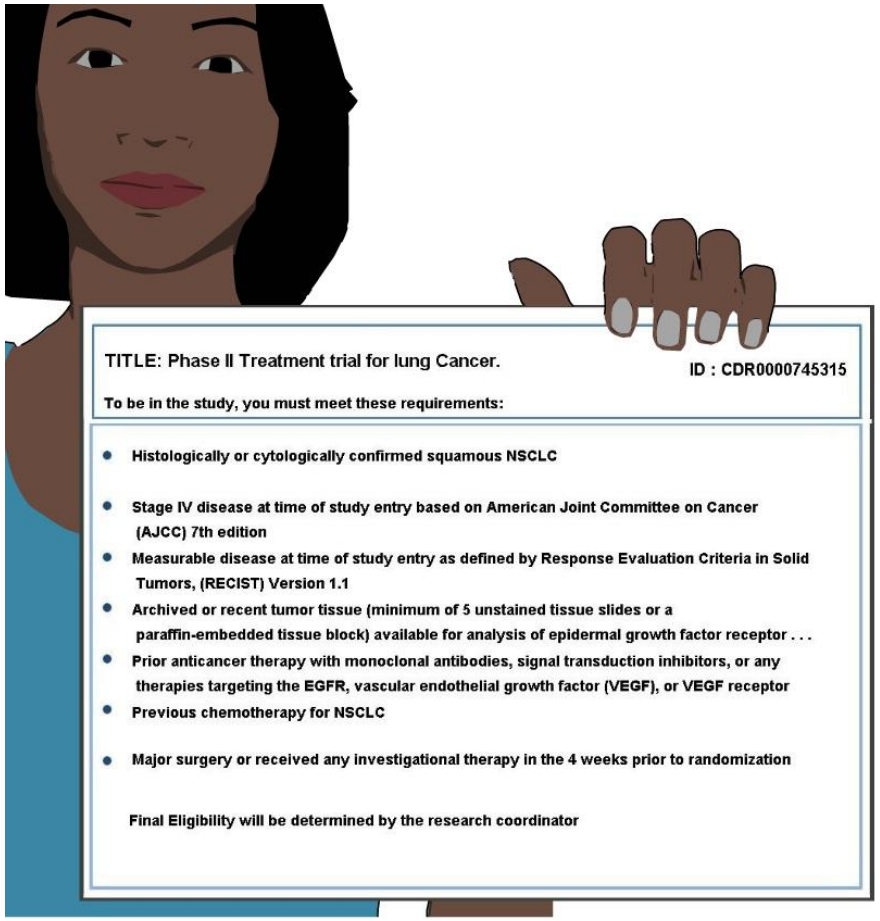
ZIP Code Lookup

Usability Results

N=23, 26% LHL

- Participants with adequate health literacy completed 1.25 search tasks on average.
- Participants with low health literacy failed to complete any of the tasks.
- Difference is significant (Mann-Whitney $p<.05$).

Conversational Agent Interface



Yes. Who should I contact to participate?

No, I don't meet the requirement.

Show me more details of the study

Save this for later Viewing

No thanks! Show me something else.

Explain it to me.

Show me the trials I have looked at.

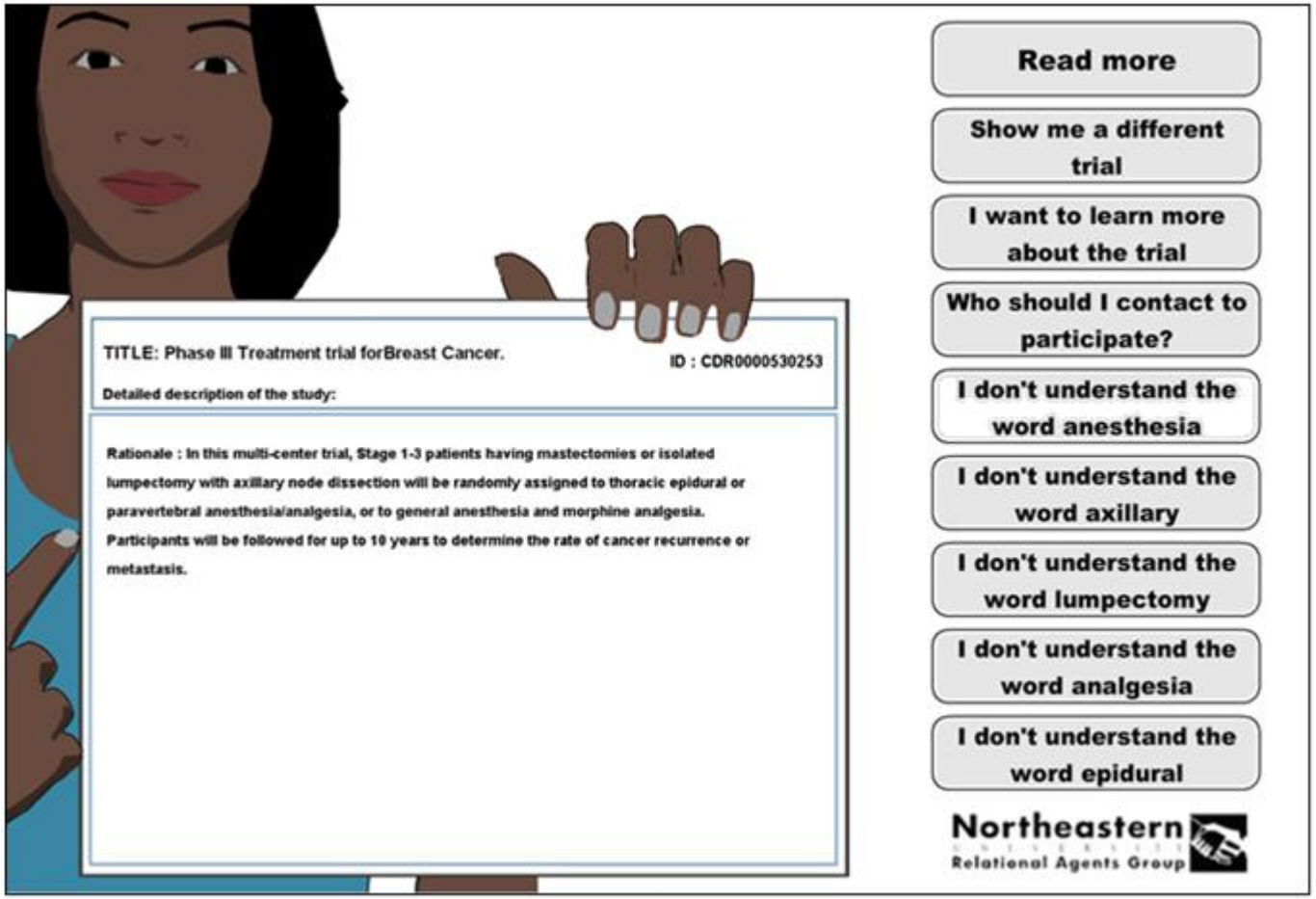
Could you repeat that please?

Northeastern University
Relational Agents Group

Design:
Search Criteria

- NCI database indices
  - age, sex, cancer type, geographic location, trial type and phase, medication use
- Inferred through text classification
  - pain tolerance, invasiveness tolerance, time commitment

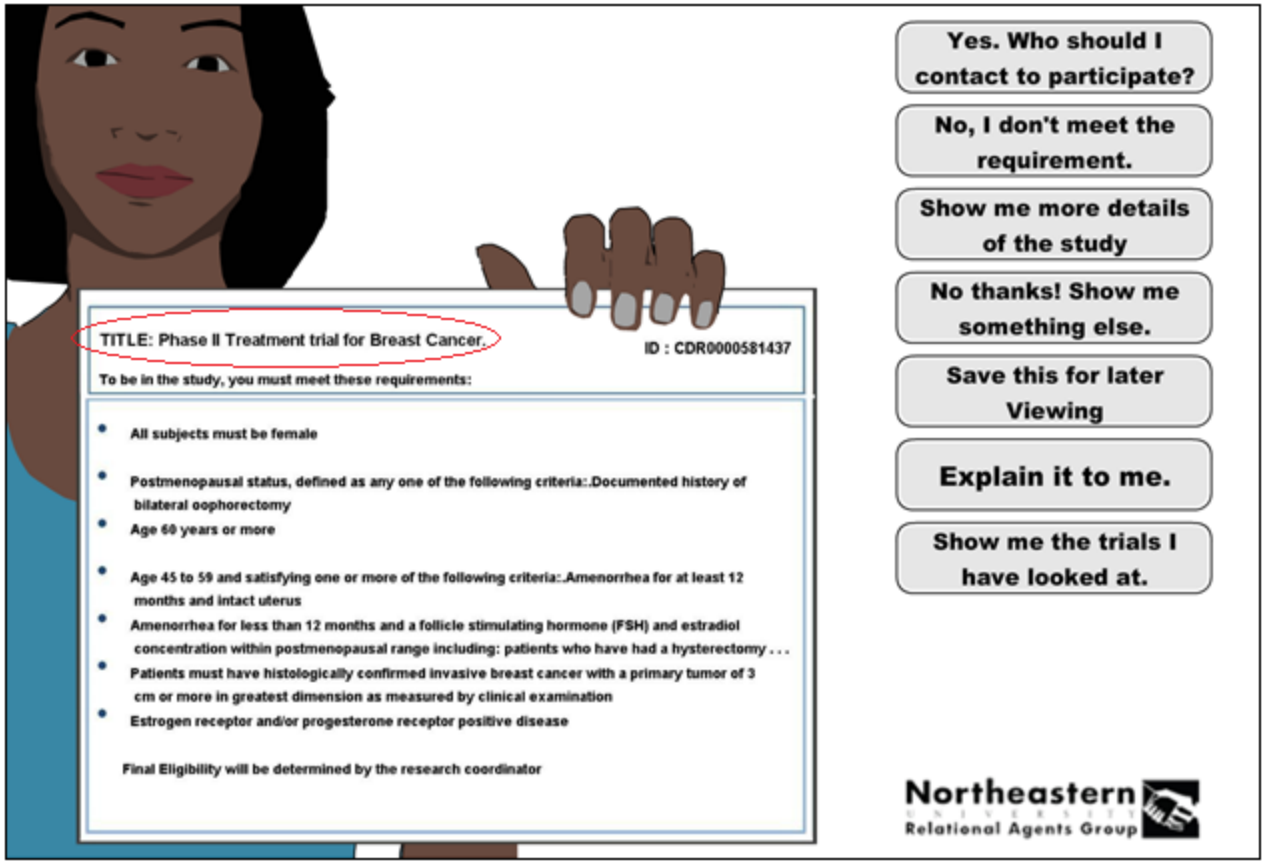
Search Interface Feature: Dictionary



Search Interface Feature: Simplified Title

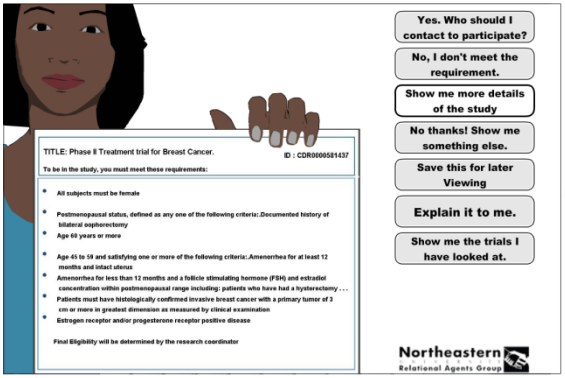
Original title:

"Phase IV Randomized Study of Doxorubicin Hydrochloride Liposome Versus Capecitabine as First-Line Chemotherapy in Women With Metastatic Breast Cancer"

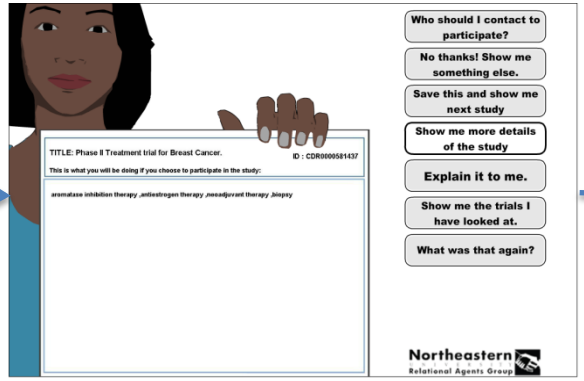


Search Interface Feature: Levels of information detail

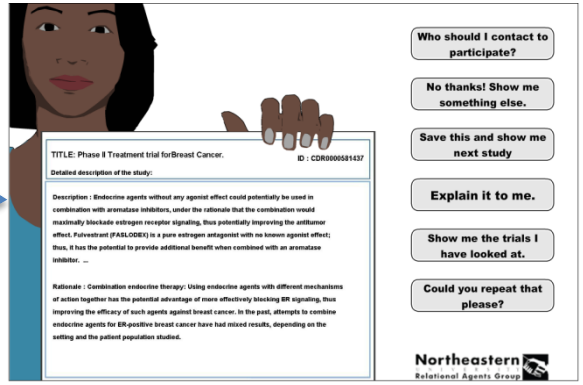
Eligibility Criteria



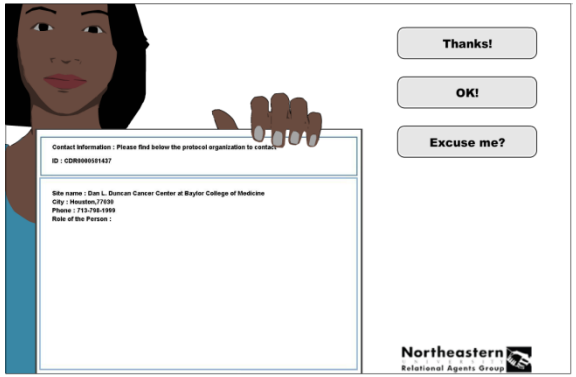
Trial Protocol



Detail Description



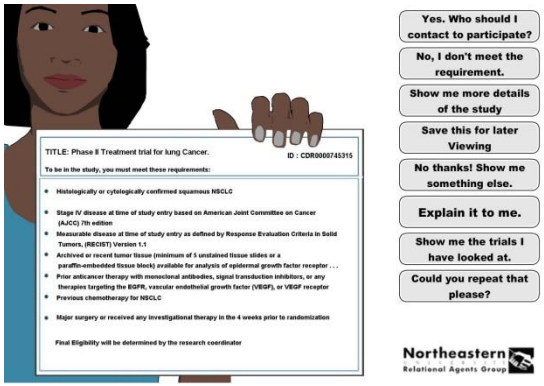
Contact Information



Preliminary Evaluation

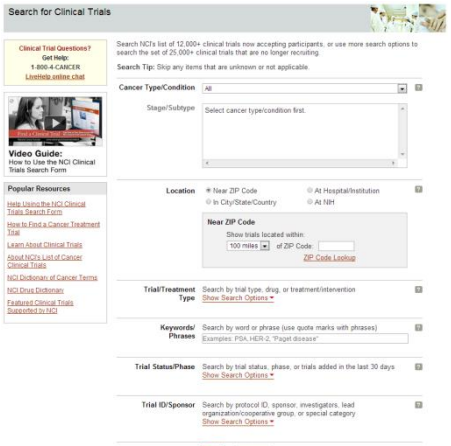
- Between subject randomized trial

AGENT



VS

CONTROL



- The agent used the same data from the NCI database of clinical trials

Preliminary Evaluation

- Search Tasks:
  - T1: search for trials with user's own criteria
  - T2 (standardized task): search for trials with specified criteria
- Measure:
  - Self-report scale measures
  - Number of trial examined
  - Number of trial that met criteria
  - ID of trial found
  - Elapsed time

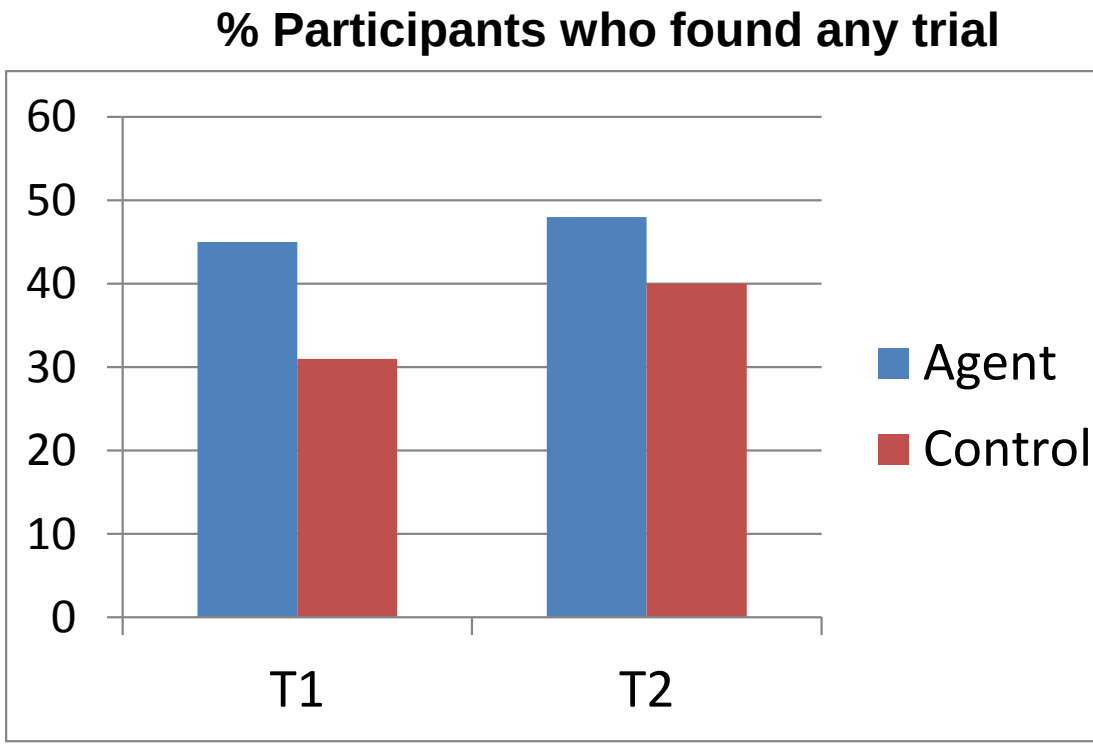
Participants

- 87 participants:
  - 42 in the AGENT condition, 45 in CONTROL
  - 50 in person, 37 online
- Age:
  - Mean: 50.1 years (SD: 9.9)
- Gender:
  - 46% male
- **Health literacy:**
  - 26% low health literacy
- Computer Experience:
  - I've never used one: 8%
  - I've used one a few times: 24%
- Search Engine Experience:
  - I've never used one: 17%
  - I've used one a few times: 18%

Results:
Success Rate

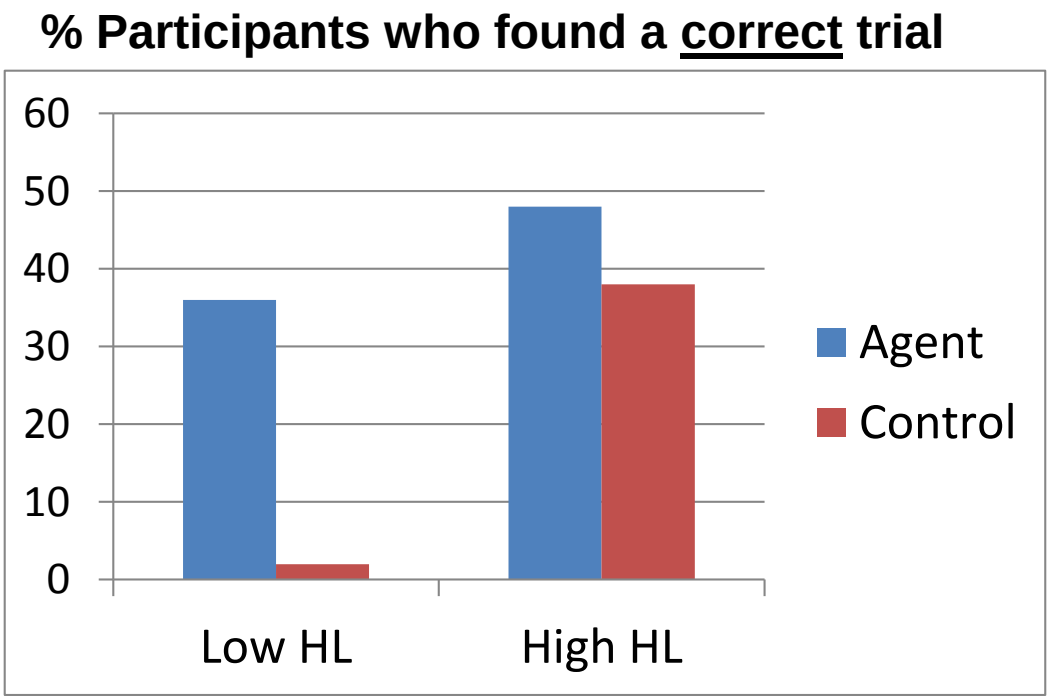
- The AGENT is at least as effective as the web-based search engine
  - T1: 45% vs. 31% (ns.)
  - T2: 48% vs. 40% (ns.)

– T2: Low HL found significantly fewer trials (27% vs. 50%)



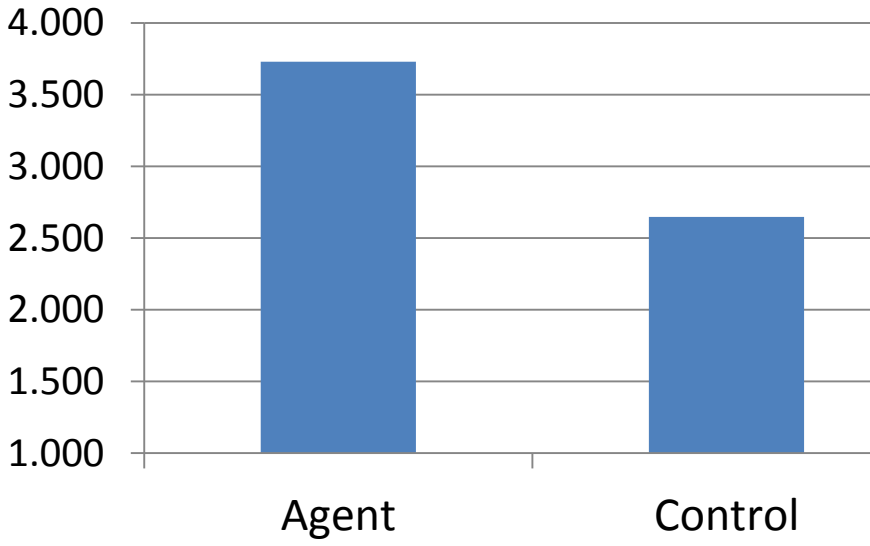
Results:
T2 Success Rate

- Main effects for AGENT and Literacy



Results:
T1 Matching of Result and Criteria

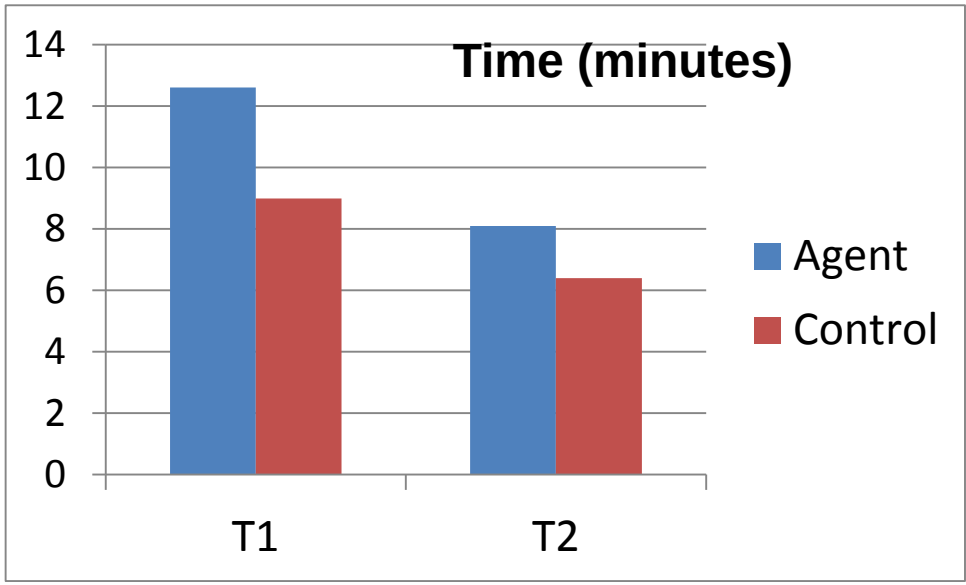
- Those in the AGENT group felt that the trials they found matched their criteria to a greater degree than those in the CONTROL group.
  - T1: 3.7 vs. 2.6, $p<.01$
  - No diff by literacy



To what degree did the trial match what you were looking for? (1=Not at all, 7=Exactly)

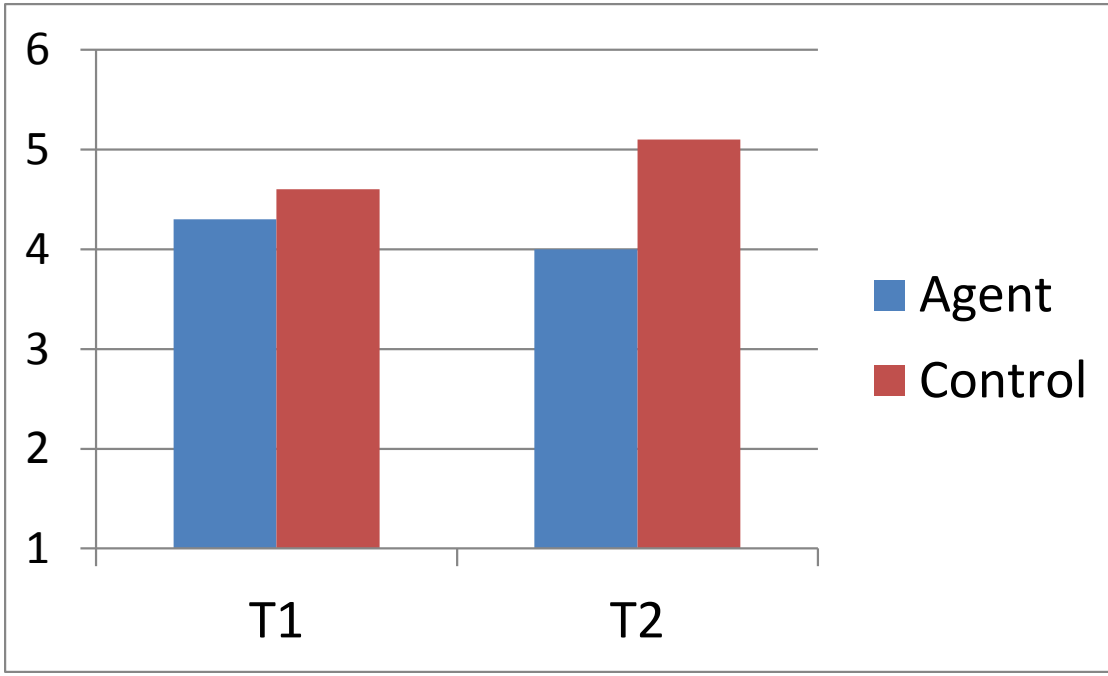
Results:
Actual Search Time

- Those in the AGENT group spent significantly more time using the system, compared to the CONTROL group.



Results:
Perceived Search Time

- T1: No significant difference in the **perceived** time spent using the system.
- T2: Agent perceived as taking significantly less time.



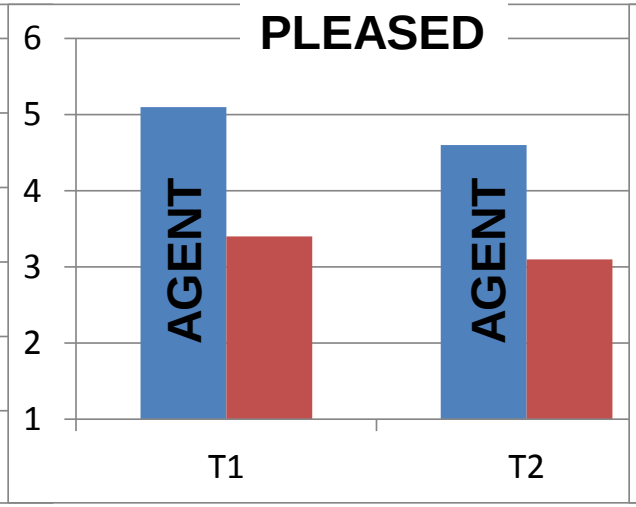
How much time do you feel it took to use the system?
(1 = Too little, 7 = Too much)

Results: T1 Satisfaction

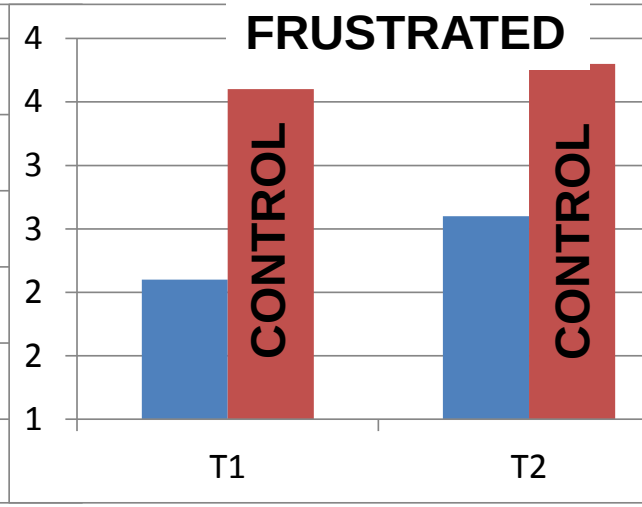
- All participants in the AGENT group were significantly more satisfied with the experience compared to those in the CONTROL group. ($p < .001$, in T1)

1 = Not at all, 7 = Very much

How satisfied were you with the clinical trial search system?



How pleased do you feel?

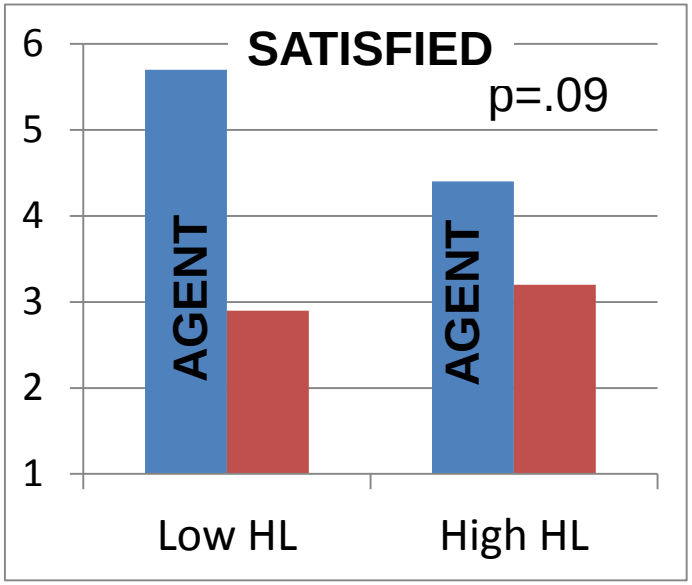


How frustrated do you feel?

Results: T2 Satisfaction x Literacy

- Low Health Literacy Participants even more satisfied with Agent than High Literacy

1 = Not at all, 7 = Very much



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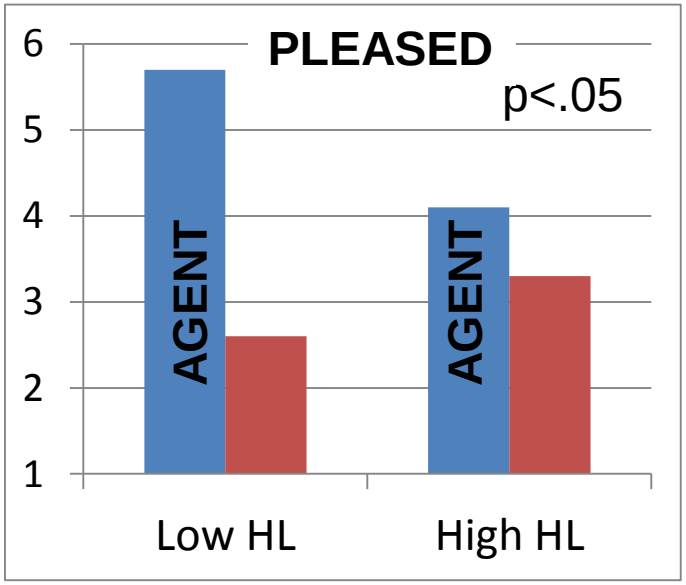
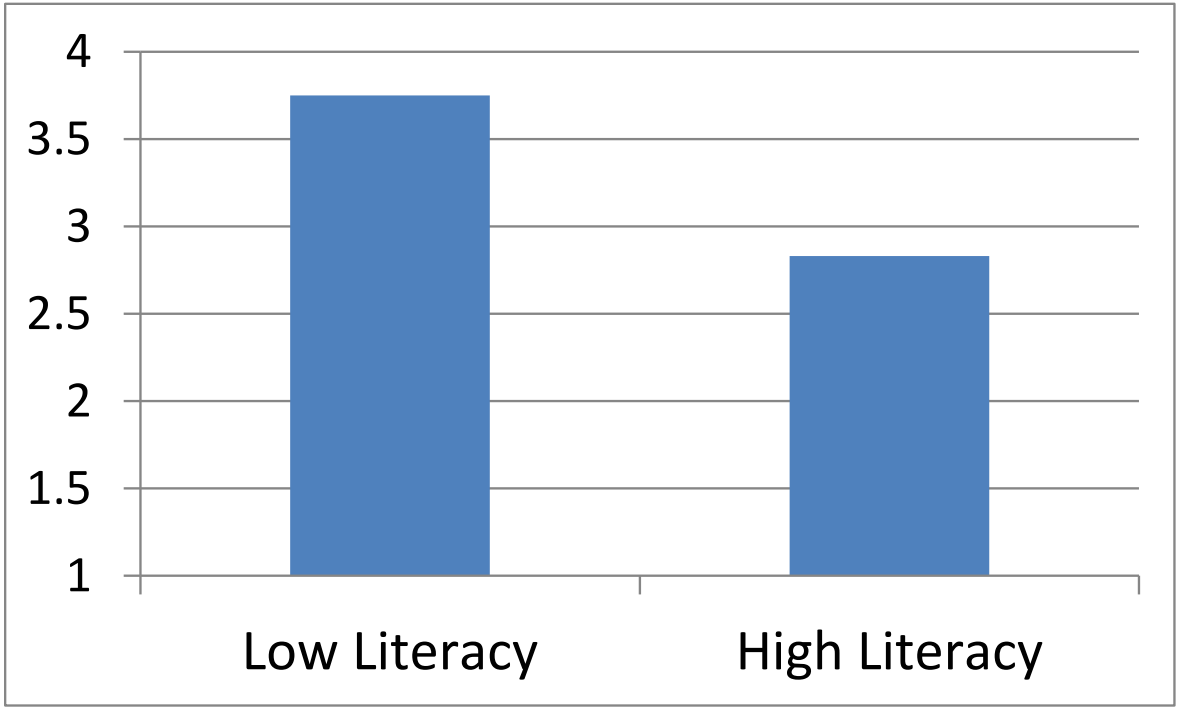


How pleased do you feel?

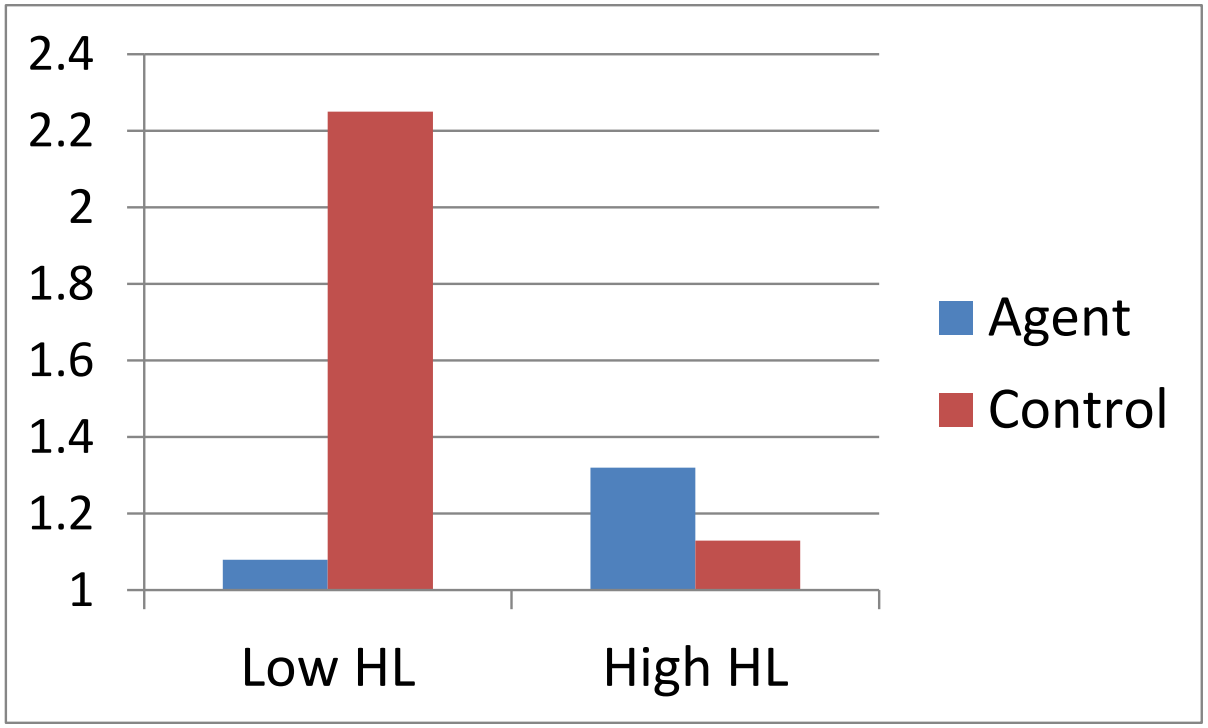
Results: T1 Likelihood to Volunteer

- Low Health Literacy participants were significantly more likely to say they would actually volunteer for the trial (p=.06)



Results: T1 Pressure to Sign

- Low health literacy participants felt the most pressure to sign up for the trial with the Web (significant interaction)



How much pressure did you feel to sign up for the trial?

Conclusions

- Participants of all literacy levels performed as well or better with Agent than Web site.
- Those in the Agent group felt better about the trials they found and were more satisfied.
- Low literacy participants:
  - Performed better (T2)
  - Even more satisfied
  - Felt less pressure