Understanding Consumers’ Quality Evaluation of Online Health Information: Using a Mixed-Method Approach

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Yan Zhang: Prior Work on Health Information Seeking

- **Consumer health information seeking: context and individual differences**

- **Quality of online health information**
Jacek Gwizdka: Prior Work on Human-Information Interaction

- Information evaluation – relevance – cognitive and multi-dimensional perspective
  - Perceived information relevance and eye-movement patterns

- Users’ domain knowledge
  - Inferring differences in domain knowledge from eye tracking data
Motivation for The Project
Consumer health information searching on the web

- 72% of web users in the U.S. and 71% in Europe have looked online for health information (Pew Internet & American Life, 2013; WHO eHealth survey, 2007)

- Track diets, healthy lifestyles, weight loss
- Prevention
- Symptoms, treatments, and self-diagnoses
Critical role of information for consumer health

- 60% of respondents reported that online information affected a treatment decision (Pew Internet & American Life, 2012)

- Improve: Attitudes towards diseases and coping, sense of control, decision making, better comply with treatment, and better management of disease (Gray et al., 2009; Tan, Mello, & Hornik, 2012; Moldovan-Johnson et al., 2014)

- Information seeking is significantly associated with preventative behaviors, such as healthy eating (McKinley & Wright, 2014)
All the positive outcomes hinges on …

Quality
However...

Zhang, Sun, & Xie, B. (In Press)

- 165 articles in which health care professionals evaluated the quality of consumer-oriented online health information on a wide range of medical subjects (more info: quality indicators on separate slides)
Consumers evaluation of online health information quality -- **Which one is right?**

Consumers evaluate the quality of online health information, they use:

- **Source indicators:** Author, affiliation, and design (Eysenbach & Kohler, 2002; Sillence, et al., 2004; Zhang, 2014)

- **Message indicators:** Whether it sounds logic; cross validation (Broussard & Zhang, 2013; Sillence, et al., 2004)

Consumers do not evaluate the quality of online health information:

- **Do not use quality indicators** (Eysenbach & Kohler, 2002; Williams, et al., 2002)

- **Having difficulties in evaluating the quality** (Arora & Hesse, 2008; Feufel, 2012; Eysenbach & Kohler, 2002; Williams, et al., 2002)

**Self reported**

**Self reported & Observed**
So..., it is worthwhile to investigate:

- Do consumers indeed evaluate the quality of online health information?
- If so, how do they evaluate? Which quality indicators do they use?
- Do individual differences, such as age and eHealth literacy, have an impact on the evaluation?
Hypotheses

• *Hypothesis 1*. Older adults are a) less likely to evaluate the quality of health information online, and b) if they do, they make use of fewer interface and content elements, than young adults.

• *Hypothesis 2*. Those with high eHealth literacy are:
  ◦ a) more likely to evaluate the quality of health information online than those with low eHealth literacy, and
  ◦ b) able to make more effective use of interface and content elements in the evaluation
Plan of work

1. Preparations for experiment
   ◦ experiment design
   ◦ system *design and development*
     • instrumenting health-related web sites for data capture

2. Lab experiment with human participants

3. Data analysis
   ◦ data cleaning and processing
   ◦ data analysis – qualitative and quantitative

4. Writing up
Motivation for Method

- Previous studies most often relied on self-reported user accounts hence were potentially biased

- To address the issues and gaps in previous studies we will use mixed-method approach combining **objective data** from eye-movements with **subjective data** from interviews and survey instruments
  - we will use retrospective think aloud protocol (RTAP)
Lab Experiment Design

- Mixed-2x2x2 design (within- and between-subjects)
- 3 independent variables, at 2-levels each:
  1. health information search task type
     • For example, looking for treatment and looking for self-diagnosis – within-subjects variable;
  2. participant age (younger and older) – between-subjects variable; and
  3. participant level of eHealth literacy (low and high) – between-subjects variable
     • Health literacy will be measured using eHEALS (8-item scale → next slide)
   ◦ Participant’s self-reported familiarity with and interest in the assigned tasks will also be recorded.
eHEALS: eHealth Literacy Scale

1. How useful do you feel the Internet is in helping you in making decisions about your health?
2. How important is it for you to be able to access health resources on the Internet?
3. I know what health resources are available on the Internet
4. I know where to find helpful health resources on the Internet
5. I know how to find helpful health resources on the Internet
6. I know how to use the Internet to answer my questions about health
7. I know how to use the health information I find on the Internet to help me
8. I have the skills I need to evaluate the health resources I find on the Internet
9. I can tell high quality health resources from low quality health resources on the Internet
10. I feel confident in using information from the Internet to make health decisions

Lab Experiment Design continued

- The *dependent* variables will include
  - behavioral measures (e.g., time spent on different types of web pages,
  - interaction with different elements of web pages (clicks and eye gaze),
  - transition between web pages, and transitions within web pages, and
  - eye movements measures
    - patterns of eye movement
    - fixation duration
    - pupil dilation
A Digression -
Eye movements and eye-tracking
Human Vision Fundamentals

- **Eye-mind link hypothesis**: attention is where eyes are focused
  (Just & Carpenter, 1980; 1987)
Eye Movement and Visual Acuity

- Foveal, Parafoveal and Peripheral areas

Figure source: Tobii website

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Visual Acuity and Reading

Around the fixation point only four to five letters are seen with 100% acuity.

2° (70px) foveal region
parafoveal region
Modern Eye-tracking Equipment

- Current eye-trackers are computerized and “easy to use”
  - infrared light sources and cameras (low-accuracy possible using webcams)
  - use corneal light reflection
  - stationary (“remote”) and mobile (wearable)

Example Tobii eye-trackers
Pupil Dilation

- Pupils dilate in reaction to light and as a result of increased mental effort or arousal
- Eye-trackers measure pupil dilation
Example Web Page

DRUGS & MEDICATIONS
Warfarin
COMMON BRAND NAME(S): Coumadin
GENERIC NAME(S): WARFARIN SODIUM

Uses
This medication is used to treat blood clots (such as in deep vein thrombosis-DVT or pulmonary embolus-PE) and/or to prevent new clots from forming in your body. Preventing harmful blood clots helps to reduce the risk of a stroke or heart attack.

Conditions that increase your risk of developing blood clots include a certain type of irregular heart rhythm (atrial fibrillation), heart valve replacement, recent heart attack, and certain surgeries (such as hip/knee replacement).

Warfarin is commonly called a "blood thinner," but the more correct term is "anticoagulant." It helps to keep blood flowing smoothly in your body by decreasing the amount of certain substances (clotting proteins) in your blood.

How to use warfarin
Read the Medication Guide provided by your pharmacist before you start taking.
Eye Movement Patterns on a Web Page

Variety of patterns

© Dong et al. 2008
Eye-Movements Patterns Differ - Relevance

Text relevance affects:
◦ How the text is read
◦ Cognitive load

Eye-movement $\rightarrow$ relevance
◦ reading patterns, eye-movement measures, pupil dilation:
  65%-74% classification accuracy of predicting binary relevance

(Gwizdka, J., 2014)
Preliminary Analysis Framework

Layered model of information evaluation

- **usability level** → page elements
  - do people see the elements that they should consider in evaluating information
    - evidence: eye fixations on page elements + interview

- **readability level** → text/images inside page elements
  - do people read and understand different elements that affect information evaluation
    - evidence: eye movement patterns within elements + interview

- **cognitive level** → relations between elements
  - do people know how to relate and make sense of page elements in evaluating information
    - evidence: eye movement patterns between elements + interview

- How does age, eHealth literacy affect the above?
Expected Project Outcomes

- Learn if consumers actually evaluate quality of online health information
- If they do evaluate it, how they do it
- Learn about differences in online health information evaluation
  - between younger and older adults
  - between people low and high on eHealth literacy
- Inform design of online health sites to promote information evaluation
- Tailor training materials to users in different age groups and with different levels of eHealth literacy
Thank you!  

Questions?

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