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Cognitive biases during information searching

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Research questions

- Do people experience **cognitive biases** while searching for information?
- Can we **de-bias information searching**?
- Would correcting for these biases **improve decision making**?

1. Do people experience cognitive biases while searching for information?

- **Order effects ***:
 - Retrospective analysis
 - 75 clinicians x 6 questions
 - Prospective analysis
 - 227 health consumers x 6 questions
- primacy (Asch, 1946),
recency (Miller & Campbell, 1959)
- **Exposure effect *** (Varey & Kahneman, 1992)
- **Reinforcement effect** (Zajonc, 1968)
- **Anchoring *** (Tversky & Kahneman, 1974)

Lau & Coiera, 2007, JAMIA, vol 14(5)

2. Can we de-bias information searching?

- Pre/post experimental study
- **227 health consumers**, each with:
 - 6 health-related questions
 - 3 user interfaces: baseline, two de-bias interventions
- Example of a question
 - Can we catch AIDS from a mosquito bite?
- **Baseline vs. de-bias interface**
 - decision accuracy, confidence, search behaviour

Anchor de-bias intervention

- How:
 - ask subject to decide, whether the document supported the *affirmative, negative, neutral* side of the question (Arnott, 2006; Lopes, 1982)
- Rationale:
 - user builds and sees the body of evidential support for *each* possible answer
 - aimed at overcoming the pre-assumptions the user may have had before searching



Is there evidence to support that smoking causes lung cancer?

Search

Select a Profile

Health information

Enter Keywords

Disease	<input type="text" value="lung cancer"/>	<input type="button" value="Builder"/>
Drug	<input type="text"/>	<input type="button" value="Builder"/>
Symptoms	<input type="text"/>	<input type="button" value="Builder"/>
Others	<input type="text" value="smoking"/>	<input type="button" value="Builder"/>

Viewed results

For
(3 documents)

Neutral
(0 documents)

Against
(1 documents)

1.8. Cigarette Smoking and Cancer: Questions and Answers

Source: *MedlinePlus* ()



My notes: Cigarette smoking causes 87 percent of lung cancer deaths

1.3. Lung Cancer Questions and Answers

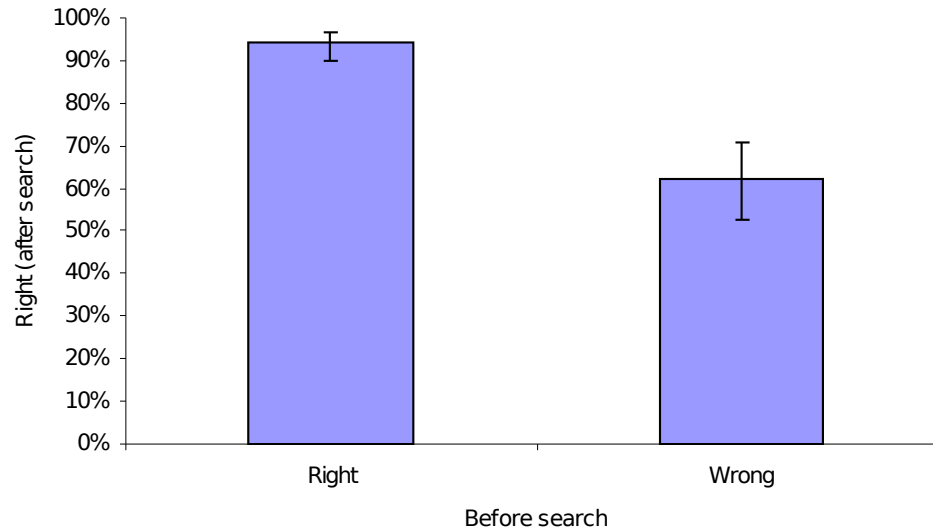
Source: *MedlinePlus* ()



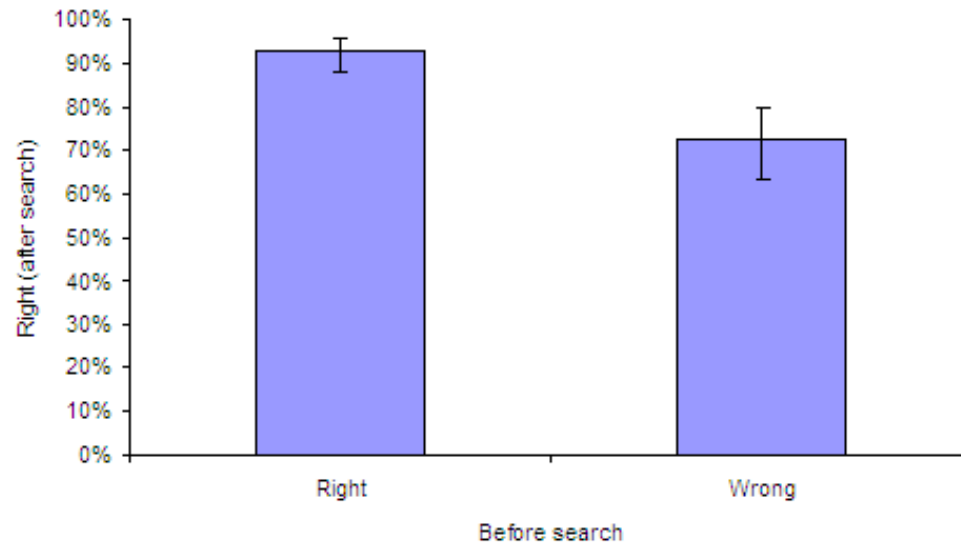
My notes: Eating a lot of fat and cholesterol might increase your risk of lung cancer. Drinking a lot of alcohol may raise your risk as well.

De-biasing anchoring effect

Baseline:
 $P < 0.001$



Intervention:
 $P < 0.001$



Does using the anchor de-bias interface improve decision making?

- Improve decision accuracy: WR proportion increases by 10%
- Increases no. of highly confident correct post-search answers
- Access more documents in fewer no. of searches

Lau & Coiera, 2007, JAMIA (submitted for review)

Order de-bias intervention

- How:
 - rearrange documents in a new order for self review (Ashton & Kennedy, 2002; Tubbs et al.,1993)
 - Original order: D1, D2, D3, D4
 - New order: D2, D1, D4, D3
- Rationale:
 - to review documents in a new sequence unaffected by the order they were originally viewed

Is there evidence to support that smoking causes lung cancer?

Search

Select a Profile

Enter Keywords
Disease
Drug
Symptoms
Others

Selected results

1.8. Colds
Source: *Child and Youth Health - CYH (South Australia)* (Jan, 2005)



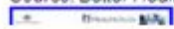
My notes: A cold is caused by a virus that affects the nose and throat

1.2. Vitamin C for preventing and treating the common cold
Source: *Informed Health Online* (Nov, 1997)



My notes: Vitamin C does not prevent the common cold, but very high doses probably shorten the length of the illness

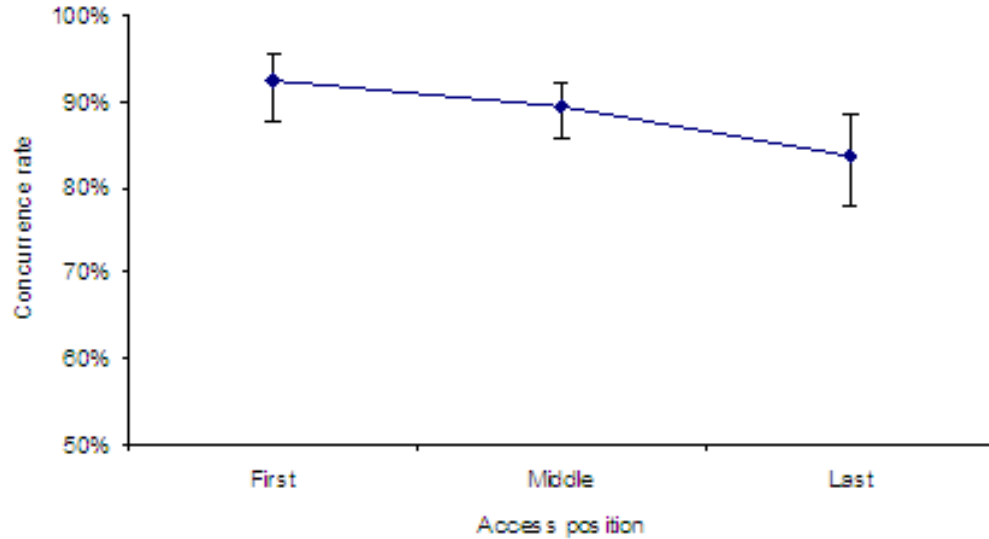
1.3. Vitamins - common misconceptions
Source: *Better Health Channel* (Nov, 2004)



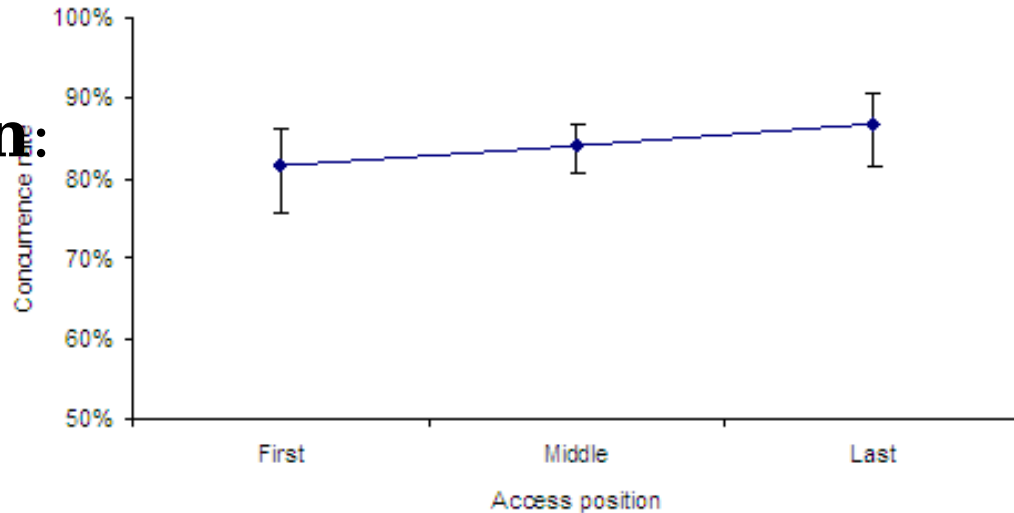
My notes: Vitamin supplements are commonly misused and taken as a form of medicine to treat ailments such as colds or to counteract lifestyle issues such as stress.

De-biasing order effect

Baseline:
 $P = 0.026$



Intervention:
 $P = 0.34$



Does using the order de-bias interface improve decision making?

- No difference in decision accuracy, nor in confidence in answers
- Access more documents in fewer no. of searches

Lau & Coiera, 2007, JAMIA (submitted for review)

Summary of findings

1. People can experience order and anchoring biases during information searching
2. Order effect during search can be de-biased
3. Attempts to de-bias information searching :
 - improve decision accuracy by up to 10%,
 - affect confidence in answering questions, and
 - improve user search efficiency

More information

- Annie Lau: a.lau@unsw.edu.au
Website: www.chi.unsw.edu.au
- Lau AYS, Coiera EW. (2007) Impact of web searching and social influences on consumer decision making: a prospective online experiment. JAMA (submitted for review)
- Lau AYS, Coiera EW. (2007) Can information search be de-biased to improve decision making? JAMIA (submitted for review)
- Lau AYS, Coiera EW. (2007) Do people experience cognitive biases while searching for information? JAMIA (preprint: vol14, issue 5)
- Lau AYS, Coiera EW. (2007) How do clinicians search for and access biomedical literature to answer clinical questions? MedInfo, Brisbane, Australia.
- Lau AYS, Coiera EW. (2006). A Bayesian model that predicts the impact of web searching on decision making. JASIST 57:873-80.

