Re-examining the left and top means first heuristic using eye-tracking methodology

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Introduction I

- Web surveys use written language to convey information.
  - *Textual information.*

- This language is accompanied by visual cues.
  - *Non-textual information.*
  - *Easy to employ typefaces, fonts, shapes, colors, graphics etc.*
  - *Additional source of information.*

- Reasons for the use of visual material.
  - *Helping respondents to correctly fill out survey instruments.*
  - *Making the survey experience more enjoyable.*
Introduction II

- Visual cues/material can affect response behavior.
  - Cognitive question processing.
  - Response distributions.
  - Data quality (e.g., reliability and validity).

- “Cooperative communicators” (Schwarz, 1996).
  - Respondents use any information provided by the instrument.
  - Textual and non-textual information.

- Application of interpretive heuristics in survey responding (Tourangeau et al., 2000).
Interpretive Heuristics I

- Tourangeau et al. (2004) proposed five interpretive heuristics in survey responding:
  - *Middle Means Typical,*
  - *Left and Top Means First,*
  - *Near Means Related,*
  - *Up Means Good,*
  - *Like means close.*

**THESE HEURISTICS ASSIGN MEANING TO SPATIAL AND/OR VISUAL CUES IN SURVEYS.**
Interpretive Heuristics II

- Left and Top Means First (LFT):
  - It corresponds to the reading direction in most Western languages.
  - For example, English, French, Spanish, and German.

- Respondents expect ... 
  - ... that the first option of a scale represents the first one.
  - ... that the successive options follow in a logical order.
  - ... that the lowermost option represents the opposite endpoint.

**FOR EXAMPLE: VERY GOOD, GOOD, (...), BAD, VERY BAD**
Interpretive Heuristics III

- Tourangeau et al. (2004) varied the order of the options.
  - Experiment 4: Order of the response options (pp. 381-384).

- The authors report the following results:
  - Response times increased with the order discrepancies (see also Holbrook et al., 2000).
    - It seems that respondents get confused by inconsistencies.
    - The selection of the middle option depends on its position.
      - Indicating an effect of the option order.
    - The findings suggest the application of the LFT heuristic.
Eye-Tracking Methodology

- We used a SMI RED250 mobile eye-tracking system.
- Gaze behavior classification¹:
  - During reading the eyes make quick movements → saccades.
  - They are accompanied by moments when the eyes pause → fixations.

  **Immediacy Assumption**
  Interpretations at all levels of processing are not deferred.²

  **Eye-Mind Assumption**
  Fixation time corresponds to the duration of central processing.²

¹ Rayner & Pollastek (2006)
² Just & Carpenter (1980)
Research Hypotheses

**H1:** Respondents fixate longer and more often on the scale options, the more inconsistent they are with the LFT heuristic.

**H2:** Respondents show more re-fixations between the scale options, the more inconsistent they are with the LFT heuristic.

**H3:** Respondents fixate shorter and less often on the conceptual middle option if it is presented on the bottom of the scale than if it is presented at the top or the middle of the scale.
Methods: Research Design

- The experiment is a “direct” replication of Tourangeau et al. (2004) → N = 131.
- All groups received 2 agree/disagree questions dealing with physician-patient relations.
- We used 5-point fully-labeled response scales with a vertical alignment.
- Each question was presented individually (see Appendix).
- We used black text with a white background.

Center of Methods in Social Sciences
Methods: Condition Examples

Do you agree or disagree with the following statement?
It is sensible to do exactly what the doctors say.

<table>
<thead>
<tr>
<th>Consistent</th>
<th>Mildly Inconsistent</th>
<th>Strongly Inconsistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>agree strongly</td>
<td>agree strongly</td>
<td>it depends</td>
</tr>
<tr>
<td>agree</td>
<td>agree</td>
<td>disagree</td>
</tr>
<tr>
<td>it depends</td>
<td>disagree</td>
<td>disagree strongly</td>
</tr>
<tr>
<td>disagree</td>
<td>disagree strongly</td>
<td>it depends</td>
</tr>
</tbody>
</table>

see Tourangeau et al. (2004)
Methods: Participants

The study was conducted in the pretest lab at the GESIS – Leibniz Institute for the Social Sciences in April 2017.

<table>
<thead>
<tr>
<th>Final Sample Size:</th>
<th>N = 111</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender:</td>
<td>50% female</td>
</tr>
<tr>
<td>Age (in years):</td>
<td>38% (18-24), 38% (25-44), 19% (45-64), 5% (65 or older)</td>
</tr>
<tr>
<td>Education:</td>
<td>7% lower secondary school</td>
</tr>
<tr>
<td></td>
<td>14% intermediate secondary school</td>
</tr>
<tr>
<td></td>
<td>79% at least college preparatory secondary school</td>
</tr>
<tr>
<td>Survey Experience:</td>
<td>37% participated in a web survey once before</td>
</tr>
</tbody>
</table>

Note. Chi-square tests revealed no significant differences between the groups with respect to gender, age, education, and survey experience.
Methods: Analytical Strategy

- Eye-tracking parameters:
  - Fixation count,
  - fixation time,
  - re-fixations.

- Re-fixations had to be coded.
  - Two coders coded the eye-tracking videos.
  - Interrater reliability was excellent (IRC = .86).

- Eye-tracking data aggregation for the two questions.
- All analyses were conducted with Stata version 13.
Fixation Count and Time on Full Scale

**Fixation Count**

<table>
<thead>
<tr>
<th>Consistent</th>
<th>Mildly Inconsistent</th>
<th>Strongly Inconsistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.9</td>
<td>21.1</td>
<td>25.1</td>
</tr>
</tbody>
</table>

**Fixation Time (ms)**

<table>
<thead>
<tr>
<th>Consistent</th>
<th>Mildly Inconsistent</th>
<th>Strongly Inconsistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>5382</td>
<td>7173</td>
<td>7257</td>
</tr>
</tbody>
</table>

*p < 0.05*

Note. The p-value is based on a F-test. Control of α-inflation was achieved by the Bonferroni post-hoc correction for equal variances.
Re-Fixations Between Options

Note. The *p*-value is based on a *F*-test. Control of *α*-inflation was achieved by the Bonferroni post-hoc correction for equal variances.
Fixation Count and Time on Conceptual Midpoint

Note. The p-value is based on a F-test. Control of α-inflation was achieved by the Bonferroni post-hoc correction for equal variances.
Limitations

- Small sample size (N = 131).
- Highly educated respondents.
- No randomization of options.
  - Systematic variation.
- Only agree/disagree questions.
  - E.g., frequency questions (see Tourangeau et al., 2004).
- No investigation of data quality.
  - E.g., criterion validity.
Summary & Conclusion

- Respondents seem to make use of the LFT heuristic.
- The findings support the assumptions made by Tourangeau et al. (2004).
  - Supporting evidence for H1, H2, and H3.
- An inconsistent option order impedes responding.
  - Fixation count, fixation time, and re-fixations.
- Option position affects their processing – e.g., middle option.

Eye tracking provides “direct” evidence about question processing.
Many thanks for your attention!

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Literature


Appendix: Screenshots of Questions

Consistent

Mildly Inconsistent

Strongly Inconsistent

see also slide #10.
Appendix: Question Wording

Experimental Question 1:

Do you agree or disagree with the following statement? It is sensible to do exactly what the doctors say.

Agree strongly, agree, it depends, disagree, disagree strongly (consistent order)

Experimental Question 2:

Do you agree or disagree with the following statement? I have to be very ill before I go to the doctor.

Agree strongly, agree, it depends, disagree, disagree strongly (consistent order)