Using Longitudinal Paradata to Explain Page-Level Response Times in an Online Panel Survey

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Background and Knowledge Gap

• Item response times and its antecedents are widely been used to explore measurement quality in cross-sectional surveys (Couper & Kreuter, 2013; Callegaro et al., 2009; Yan & Tourangeau, 2008)

• Examples of cross-sectional research questions on response times:
  – Galesic and Bosnjak (2009): Effect of length of questionnaire on response latency and other quality indicators (Experimental cross-sectional design)

• We are not aware of any attempt to connect such paradata across online panel waves in a longitudinal fashion (Callegaro, 2013)

Overall Research Question

• Explaining survey-page level response times and their (hierarchically) related antecedents using page-level paradata, person-level characteristics, and longitudinal information typically available in online panels.

• Understanding response times across online panel waves and their antecedents as potential indicators of changes in measurement quality. Examples of related subquestions addressable:
  – Speeding tendency across waves?
  – Answers less / more complex in earlier panel waves compared to later waves?

Hypothetical Model: Ideal Version

Level 4: Respondents

Level 3: Questionnaire Waves

Level 2: Pages

Level 1: Questions

Respondent Characteristics (e.g., age, topic knowledge, survey experience, cognitive ability)

Wave Characteristics (e.g., topic, serial position of wave, mobile versus PC access)

Page Characteristics (e.g., design features, visual complexity, No of items)

Question Characteristics (e.g., item complexity)

Average time per question (intercept)
Hypothetical Model: Testable Version

- Level 2: Respondent and Wave Characteristics
  - Age
  - Education
  - Gender
  - Internet Usage
  - Mobile Usage
  - Wave Order

- Level 1: Pages
  - Time per Page
    - Intercept
    - Stimulus Complexity
    - Response Complexity
    - Page Order in Wave

- Method: Data Source
  - GESIS Online Pilot Panel (GOPP): Feasibility study (2010-2012) preparing the GESIS Panel (since 2013)
  - GOPP = Multi-topic panel encompassing 8 survey waves in 2011 and 2012. Several methodological experiments have been conducted.
  - Subsample used:
    - Subpopulation of N=1,041 initially active panel members that participated in at least one wave without break-off and have all non-missing values on page time and covariates (N=717)

- Method: Operationalization of concepts
  - Dependent variable:
    - Time on page in seconds (server-side measurement, values 2 SD above mean excluded)
  - Level 1 predictors:
    - Serial order of page within wave (Maximum No of pages in wave 6: 76 / overall mean: 20)
    - Response complexity closed-ended questions: Ratio between (# given / # possible) answers
    - Response complexity open-ended questions: Word count
    - Stimulus complexity: Word count per survey page (centered, mean: 52)
**Method: Operationalization of concepts**

- Level 2 predictors:
  - Respondents age in years (centered at mean 43 years)
  - Respondents education – continuous
  - Respondents education – dummy coded ordinal:
  - Respondents gender (dichotomous, male reference)
  - Internet usage: Ordinal scale tranfered into continuous measure
  - Mobile usage in survey: dichotomous (no mobile as reference category)
  - Wave order (Range: 1-8, dummy coded ordinal)

- Cross-level interaction:
  - Education * Stimulus complexity: centered

**Method: Analysis approach**

- Multilevel mixed-effects linear regression
  - Level 1: Page-level characteristics
    (as graphically specified above)
  - Level 2: Respondent and wave characteristics combined
    (as graphically specified above)
  - One cross-level interaction:
    - Education * stimulus complexity

- Software: Stata 13

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**Results: Final Multi-Level Model (part 1)**

<table>
<thead>
<tr>
<th>Effect Results: Time per Page</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>z-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>21.11***</td>
<td>1.50</td>
<td>14.11***</td>
</tr>
<tr>
<td>Page characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stimulus Complexity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Words count page (centered, mean: 52)</td>
<td>0.26***</td>
<td>0.01</td>
<td>104.68***</td>
</tr>
<tr>
<td>Response complexity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answered items / possible items (closed ended)</td>
<td>8.40***</td>
<td>0.17</td>
<td>49.05***</td>
</tr>
<tr>
<td>Word count response (open ended)</td>
<td>3.32***</td>
<td>0.03</td>
<td>99.63***</td>
</tr>
<tr>
<td>Page order within wave</td>
<td>-0.06***</td>
<td>0.01</td>
<td>-20.81***</td>
</tr>
<tr>
<td>Respondent characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (centered, mean=43)</td>
<td>0.10***</td>
<td>0.01</td>
<td>7.33***</td>
</tr>
<tr>
<td>Gender (reference: Female)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.38**</td>
<td>0.38</td>
<td>1.00***</td>
</tr>
<tr>
<td>Education (ordinal)</td>
<td>-0.73***</td>
<td>0.21</td>
<td>-3.50***</td>
</tr>
<tr>
<td>Internet usage</td>
<td>-1.02**</td>
<td>0.31</td>
<td>-3.24***</td>
</tr>
<tr>
<td>Device (reference: Stationary)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mobile</td>
<td>4.66***</td>
<td>0.37</td>
<td>12.76***</td>
</tr>
</tbody>
</table>

*p < 0.05, **p < 0.01, ***p < 0.001

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**Results: Final Multi-Level Model (part 2)**

<table>
<thead>
<tr>
<th>Effect Results: Time per Page</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>z-value</th>
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</thead>
<tbody>
<tr>
<td>Wave fixed effects (reference: Wave 1)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Wave 2</td>
<td>-0.02</td>
<td>0.15</td>
<td>-0.11***</td>
</tr>
<tr>
<td>Wave 3</td>
<td>0.36</td>
<td>*</td>
<td>2.28***</td>
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<tr>
<td>Wave 4</td>
<td>-3.41***</td>
<td>0.15</td>
<td>-22.20***</td>
</tr>
<tr>
<td>Wave 5</td>
<td>-3.39***</td>
<td>0.15</td>
<td>-22.50***</td>
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<td>Wave 6</td>
<td>-4.65***</td>
<td>0.15</td>
<td>-30.91***</td>
</tr>
<tr>
<td>Wave 7</td>
<td>-1.14***</td>
<td>0.17</td>
<td>-6.88***</td>
</tr>
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<td>Wave 8</td>
<td>-4.84***</td>
<td>0.17</td>
<td>-27.87***</td>
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<tr>
<td>Cross-Level Interaction</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Education * word count page (centered)</td>
<td>-0.01***</td>
<td>0.01</td>
<td>-15.40***</td>
</tr>
</tbody>
</table>

Observations: 150,331
Groups: 717
AIC: 1,232,876

*p < 0.05, **p < 0.01, ***p < 0.001
Summary and Conclusions

• Q: Do panel members keep the same pace wave by wave?
  A: ‘No’, but no linear trend as expected.
• Q: What are the three strongest effects in the model?
  A: Mobile device usage, Last panel wave, Response complexity.
• Q: How replicable are these findings?
  A: Future research in the GESIS Panel
• Q: Are correlates of speed impacting data quality?
  A: Future research in the GESIS Panel

Thank you!

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References


Appendix

Model building / development (next slide)

• Model 0:
  – Nullmodel
• Model 1:
  – Page effects
• Model 2:
  – Model 1 + Respondent effects (education: dummies)
• Model 3:
  – Model 1 + Respondent effects (education: continuous)
• Model 4:
  – Model 3 + Random effect (Stimulus Complexity)
• Model 5:
  – Model 3 + Cross-level interaction (Education x Word count page)
<table>
<thead>
<tr>
<th>Groups</th>
<th>Stimulus</th>
<th>Effect</th>
<th>Wave</th>
<th>Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>717</td>
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