Convergent and Discriminant Validity and Common Method Bias

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Outline

• Information processing (IP)
• Choosing appropriate measures
• Choosing appropriate methods
• Research methods to prevent bias
• Statistical techniques to account for bias
Perception is Reality

Stages of IP pertinent to self-report

- Comprehension
- Retrieval
- Judgment
- Response selection
- Response execution
Information Processing: Comprehension and Retrieval

• Attend to instructions
• Identify sought information
• Link question text to personal meanings, relevant concepts, memories
• Fill in missing details accordingly
Information Processing: Judgment

• Draw inferences about retrieved information
  – Not necessarily complete picture depending on instrument wording

• Estimate opinion based on inferences
Information Processing: Response Selection

- Reconcile judgment with available response options
  - E.g., “never” vs. “all the time”
  - E.g., “strongly disagree” vs. “strongly agree”
Information Processing: Response Reporting

• Editing response for
  – Consistency
  – Social acceptability
  – Other criteria

• Physically marking a response
IP Can Influence Responding at Any Point

• Comprehension and retrieval
  – Ambiguous instructions and/or questions open to interpretation
  – Social desirability

• Judgment
  – Priming and anchoring effects (e.g., consistency motif, demand characteristics)

• Response selection
  – Anchoring effects

• Response reporting
  – All of the above
  – Particularly social desirability
Common Method Bias in Data Collection

• Using the same technique for predictor and outcome variables (e.g., Heppner et al., 2008)
• Using the same participants for data collection
• Collecting data at the same time
• Collecting data in the same place
Common Method Bias Illustration

• IV and DV both use 20 “strongly disagree … strongly agree” Likert-type items
  – Response set formation
  – Consistency motif

• Invitation sent to work e-mail
  – Contextual clues

• Administered one after the other via surveymonkey
  – Consistency motif
  – Social desirability
Issues With Instruments

• Convergent validity
  – Degree to which an instrument measures the concept or construct it is intended to measure
  – Cronbach’s $\alpha$
  – Factor analysis
  – Meta-analysis

• Discriminant validity
  – Degree to which an instrument does not measure other constructs
  – Logic: There should be a lack of correlation with theoretically unrelated instruments

• Review literature to evaluate whether both conditions are met
An Illustration Using Instrument X

• Convergent validity
  – Items on instrument X all written to “tap into” job satisfaction
  – Factor analysis reveals a single-factor structure
  – Good evidence that all items do indeed target one construct (logically, job satisfaction)

• Discriminant validity
  – Instrument X is strongly positively correlated with a measure of home-life satisfaction (marker variable)
  – Evidence that there is “nothing special” about instrument X (it does not discriminate between domains of satisfaction)
So, what’s to be done?

• Choose validated instruments
• Make sound methodological decisions
• Evaluate data statistically

• Remainder of presentation:
  – Data collection strategies for avoiding bias
  – Statistical analysis for diagnosis of bias
  – Statistical analysis for treatment of bias
Solutions: Use Multiple Data Sources

• Similar to triangulation in mixed methods (e.g., Creswell & Clark, 2011)

• Obtain data on one instrument from different sample than other instrument
  – Very often not possible
  – Exposes participants to potential anonymity problems

• Obtain measures of constructs from multiple sources
  – E.g., job satisfaction obtained from employee, but job performance obtained from employer
  – E.g., depression from clients, but also from intake notes and/or therapist assessment
Solutions: Different Contexts and Times

• Demand characteristics, consistency motif, social desirability, etc. can be “forgotten” (Podsakoff et al., 2003)
  – Temporal separation
  – Spatial separation
  – Psychological separation

• Ask participants to
  – Take a break
  – Fill out the second instrument when they get home

• Use different collection techniques for different variables (e.g., online survey, paper-and-pencil)

• Use a cover story
  – Include instructions stating that next survey is not connected to previous one
Solutions: Instructions

• Indicate that there are no right or wrong answers
• Ask to answer as honestly as possible
• Remind about anonymity and confidentiality
Solutions: Assure Anonymity

• Problem: Fear of reprisal; being misperceived, ostracized, fired, etc. due to identifiable data

• Include statements about anonymity
  – On consent form
  – Reminders in instructions

• Do not collect identifying information if it is not needed (cf. research question/s)
  – For criteria, see: [http://www.hhs.gov/ohrp/policy/checklists/decisioncharts.html](http://www.hhs.gov/ohrp/policy/checklists/decisioncharts.html)
Solutions: Counterbalancing

• Problem: Order effects
  – First instrument primes responding on second instrument

• Counterbalance order of administration
  – [http://www.psychsurveys.org](http://www.psychsurveys.org) allows for doing this automatically
  – Do not counterbalance order of items within each instrument
Diagnosis: Factor Analysis

• Exploratory factor analysis
  – Diagnose whether all instruments are responded to similarly

• There may be a problem if:
  – Items from all instruments load onto same factor
  – One factor accounts for majority of covariance among instruments

• For walk-throughs of concepts and SPSS procedures, see:
  – Concepts and SPSS:  
    http://www.statisticshell.com/docs/factor.pdf (Field, 2005)
    (Williams et al., 2010)
Diagnosis: Reverse-Coded Items

• Embedded in many existing instruments
  – Designed to force respondents into thinking about responses (Podsakoff et al., 2003)
  – If not, add your own *at the end* (cannot influence responses on previous items)

• There may be a problem if:
  – Participant agrees with an item *and* its reverse-coded counterpart (if included in instrument)
  – Participant agrees with an item *and* conceptually opposite counterparts
Diagnosis: Marker Variable

• Collect data on a measure that should be completely unrelated to measures of interest

• If there is a correlation, it’s likely that common method bias has intruded
Treatment: Partial Correlations

• Zero-order correlation ignores possible sources of bias
• Up to 40-80% of a correlation has been shown to be due to social desirability or negative affectivity (Burke et al., 1993; Podsakoff et al., 2003)

• Partial correlation allows *partiallylling out* (i.e., controlling) influence of third variable
  – Concepts and walk-through using regression: https://www.youtube.com/watch?v=-QowOyDq08M
Third Variables: Social Desirability

- Crowne and Marlowe (1960) 33-item scale
  - Drawn from ostensibly unrelated MMPI items
- Strahan and Gerbasi (1972) 10-item version
  - Highest internal consistency
  - Highest correlation with original scale (Fischer & Fick, 1993)
- Applicable to any study involving self-report
Third Variables: Negative Affectivity

• Taylor (1953) 50-item Manifest Anxiety Scale
  – Derived from MMPI
  – Validated as best indicator of negative affectivity (Brief et al., 1988; Burke et al., 1993)

• Applicable to studies of stress, anxiety, etc.
Summary

• Even if each chosen measure has good convergent and discriminant validity, IP biases can prevent arriving at valid conclusions if they are not administered rigorously

• In your research, make sure to
  – Prevent common method bias
  – Check data for common method bias
  – Statistically control IP bias


Thank You!
Questions?

Presentation available on YouTube
  • Search for “NCADE” on YouTube

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