The Percentage of Non-overlapping Data (PND): A Systematic Review of Reporting Characteristics in Systematic Reviews and Meta-analyses

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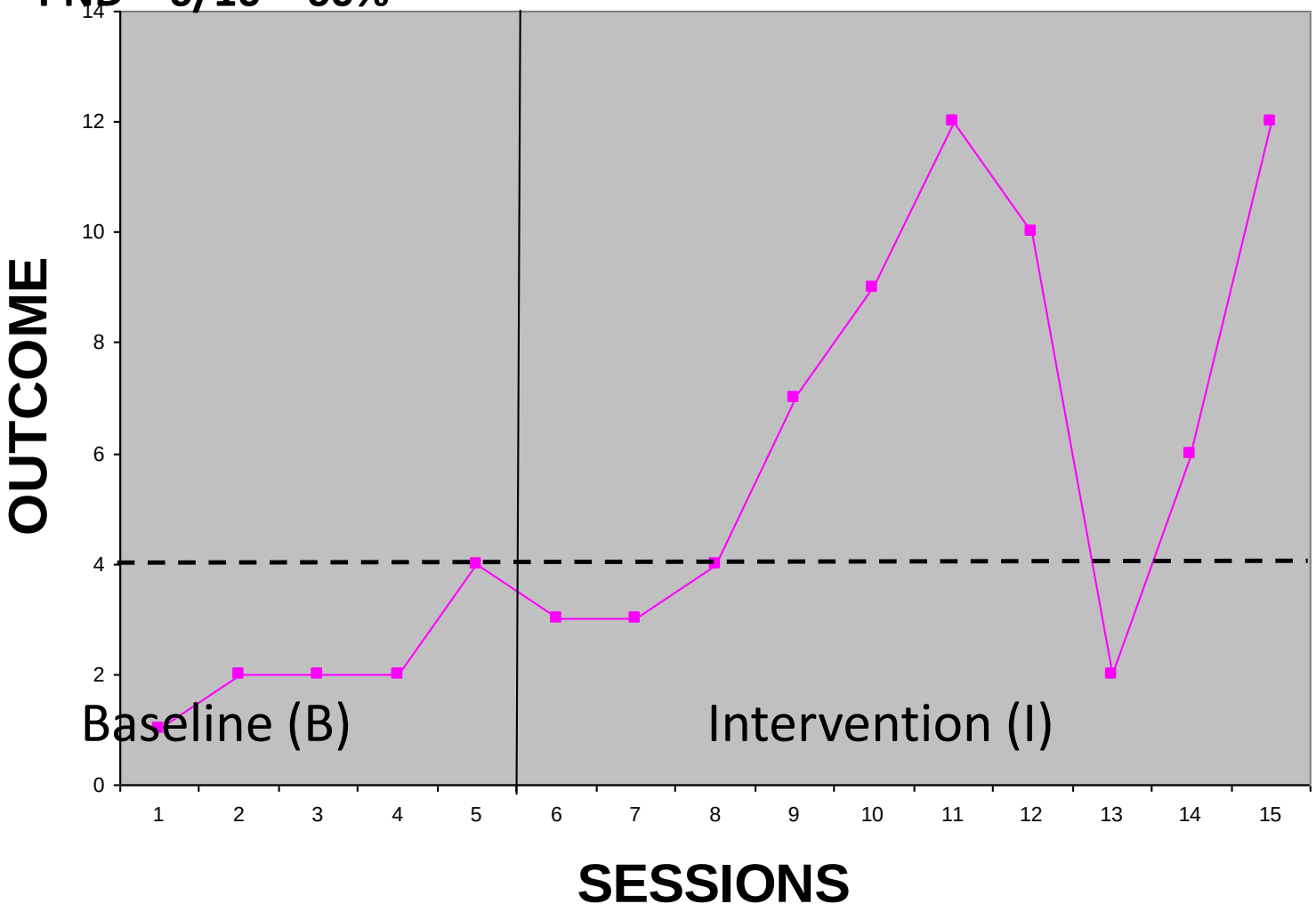
Percentage of Nonoverlapping Data (PND)

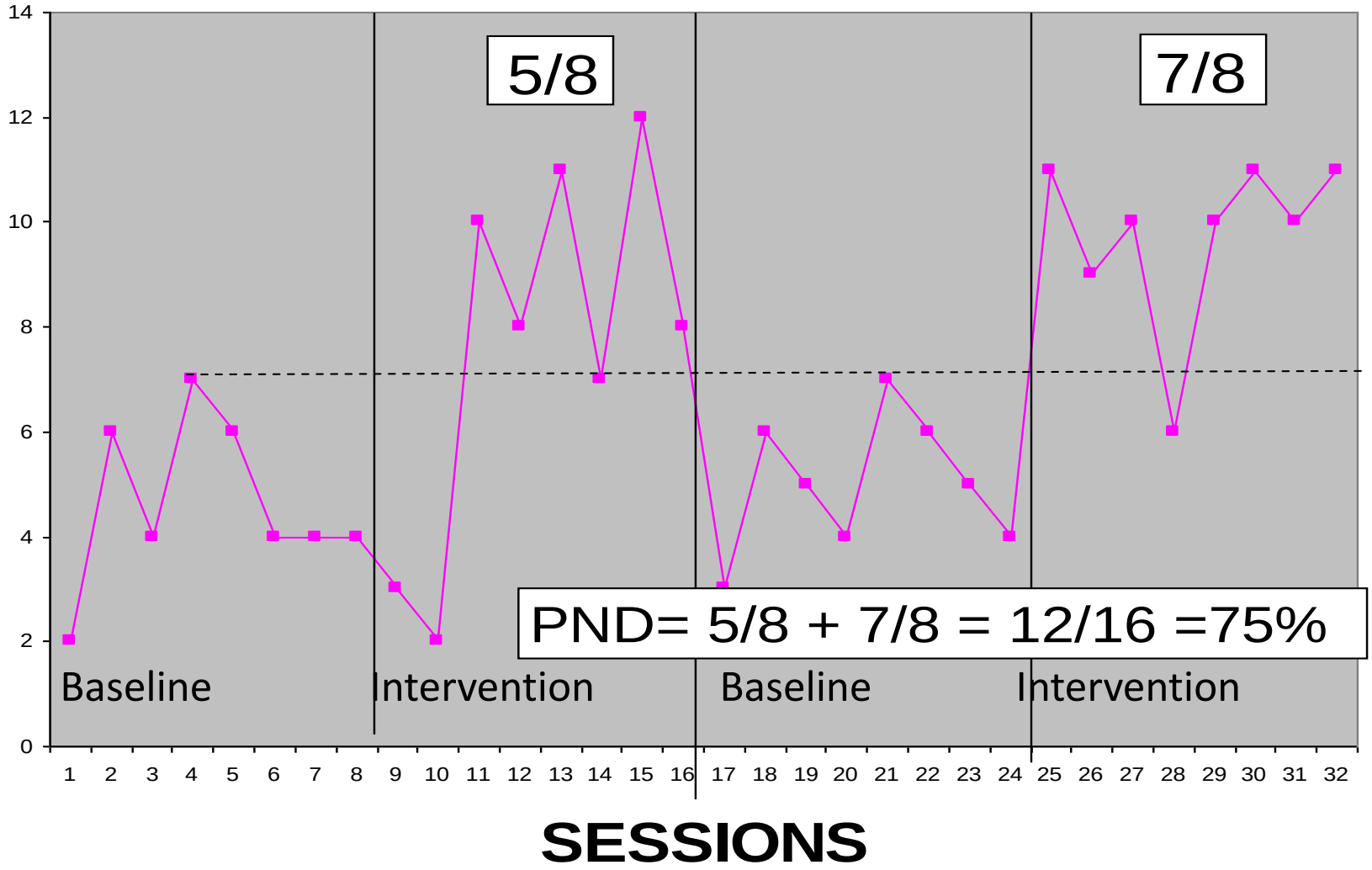
- Calculation of non-overlap between baseline and successive intervention phases (Scruggs, Mastropieri, & Casto, 1987)
  - Identify highest data point in baseline and determine the percentage of data points during intervention exceeding this level
- easy to interpret
- non-parametric statistic

PND Calculation: An Example

PND = 6/10 = 60%



PND Calculation (cont.)



Interpretation of PND scores

- If a study includes several experiments, PND scores are aggregated by taking the median (rather than mean)
  - Scores usually not distributed normally
  - Median less effected by “outliers”
- PND statistic: as higher the percentage the more effective the treatment
- Specific criteria for interpreting PND scores outlined by Scruggs, Mastropieri, Cook, and Escobar (1986)

Interpretation of PND scores (cont.)

PND range 0-100%

- PND < 50% reflects unreliable treatment
- PND 50% - 70% questionable effectiveness
- PND 70% - 90% fairly effective
- PND > 90% highly effective

Background

- Currently, it is unclear how the PND is being applied across systematic reviews and meta-analysis.
- For example, Scruggs, Mastropieri and Casto (1987) proposed several conventions for applying the PND -
  - To what extent are these being followed?
- To what extent is the application of the PND transparent, reliable, and replicable?

Purpose

- The purpose of this systematic review was to determine the reporting characteristics associated with the application of PND in systematic reviews and meta-analyses.

Criteria for Inclusion & Exclusion

- (1) PND was used to determine effectiveness
- (2) the paper needed to be a systematic review or meta-analysis of interventions using single-subject experimental designs (SSEDs)
  - use of PND in studies using SSEDs were excluded;
- (3) PND was applied to an original data set to answer a question of effectiveness
  - secondary analyses of PND applications previously reported elsewhere did not qualify;
  - methodologic/statistical comparisons with other outcome metrics did not qualify;
- (4) the paper was published in a peer-reviewed journal or as a book chapter

Search Methods

- SOURCES
  - General Purpose Databases
    - ERIC
    - CINAHL
    - Pubmed
    - PscyINFO
  - Web-based search engines
    - Google Scholar
    - Scirrus
  - Publisher-specific databases
    - ScienceDirect
    - Scopus
- “Percentage of Non-overlapping data” as an exact phrase anywhere in title, abstract, text
- Ancestry searches of reviews and articles

Data Extraction

- Coding categories
  - I. Inclusion criteria stage
    - Any criteria related to PND application
    - Minimum # of data points
    - Baseline
    - Graphic display of data
    - Ceiling/floor effects
  - I. Data extraction stage
    - Behavior change, generalization, & maintenance
    - Defined conventions for *behavior change designs*
      - Conventions stated
    - Defined conventions for *generalization designs*
      - Conventions stated and what comparison phase
    - Defined conventions for *maintenance designs*
      - Conventions stated and what comparison phase

Data Extraction

- Coding categories
  - II. Data extraction stage continued
    - IOA for PND application
    - Absence of baseline handling
    - Exclusion of ceiling/floor effects from PND calculation
  - III. Data analysis stage
    - Aggregation of data across studies
    - Mean or Median?
    - Rationale for not using the median
    - Handling of ceiling/floor effects in baseline
  - IV. Data interpretation
    - Use of classification by Scruggs et al (1987) into
      - highly effective (PND > 90), effective (70-90, questionable (50-70, unreliable (< 50)
- Coding procedures

Results

- 30 Systematic Reviews or Meta-analyses
- 1985-2008
- Inclusion criteria
  - 68.96% (20) had inclusion criteria related to PND
  - 13.79% (4) stated a minimum number of data points
  - 41.37 (12) required the presence of a baseline
  - 41.37% (12) required a graphic display of data
  - 3.4% (1) excluded baselines with ceiling/floor effects
- Data extraction
  - 100% (29) evaluated *intervention* effectiveness
  - 58.62% (17) evaluated *generalization* effectiveness
  - 51.72% (15) evaluated *maintenance* effectiveness

Results - Data extraction

- Conventions for Intervention Designs
  - 10.34% (3) provided conventions for three designs
  - 27.58% (8) provided conventions for two designs
  - 51.72 (15) provided conventions for one design
  - 13.79% (4) provided conventions for no designs

Results - Data Extraction

- Conventions for Generalization Designs
  - 11.76% (2 out of 17) provided conventions for generalization designs
  - 0% (0 out of 17) defined the comparison condition
- Conventions for Maintenance Designs
  - 29.41% (5 out of 17) provided conventions for maintenance

- 44.83% (14 out 29) provided IOA for the calculation of PND
- 4.5% (1 out of 22) dealt with absences of baseline in the data extraction phase
- 0% (0 of 28) excluded data series with baseline ceiling/floor effects in the data extraction phase

Results - Data analysis stage

- 89.6% (26 of 29) aggregated PND across studies
- 34.61% (9 of 26) used the median to aggregate PND across studies
- 12.5% (3 of 24) handled baseline ceiling/floor effects in data analysis

Discussion

- The application of PNDs across systematic reviews and meta-analyses varies greatly in quality
- Conventions for coding major designs (intervention, generalization, maintenance) need to be revisited
- Transparency of PND applications can be improved by stating:
  - Inclusion criteria specific to PND
  - Defining the conventions for coding PND across designs
  - Collecting and reporting IOA specifically for PND calculations
  - Reporting conventions for handling baseline ceiling/floor effects

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Thank you!

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