Comparison of Measurement Systems for Collecting Teacher Language Data in Early Childhood Settings

Jennifer E. Cunningham, MEd., Kathleen N. Zimmerman, MaEd., Mary E. Rogers, M.S., Jennifer R. Ledford, PhD., Ann P. Kaiser, PhD.
Vanderbilt University

VANDERBILT Peabody College

Background

- Teacher language input plays an important role in child language development (Dickinson & Porche, 2011; Giralometto & Weitzman, 2002).
- Enhancing teacher language input is of particular concern in classrooms serving children with or at risk for language impairments, considering the relationship between early language delays and future literacy skills (e.g., Bowles et al. 2009; Rescorla, 2009).
- An essential task in designing research aimed at training teachers to support child language growth is determining how to measure teacher language input within a complex classroom environment.
- The existing literature examining the efficacy and efficiency of various measurement systems in classroom research is largely limited to behaviors and participant populations that are outside the field of language development in early childhood special education (Lane & Ledford, 2014).
- Additional information is needed to determine the extent to which various measurement procedures, particularly those that are more feasible for use in complex classroom environments, are valid and reliable for estimating teacher language input.

Research Objectives

The goal of this study was to compare the **accuracy and efficiency** of three measurement systems in capturing teacher language in inclusive preschool classrooms: **Momentary Time Sampling (MTS)**, **Partial Interval Recording (PIR)**, and **Timed Event Recording (TER)**. The research questions addressed were:

1. Do discontinuous measurement systems (MTS and PIR) accurately capture the frequency of child directed teacher talk?
2. Do discontinuous measurement systems (MTS and PIR) accurately capture the quality of teacher language, as measured by the proportion of teacher utterances coded as language supportive?
3. Do discontinuous measurement systems (MTS and PIR) accurately capture the duration of child-directed speech?
4. Which measurement system (MTS, PIR, or TER) is the most efficient when data are collected via video recordings?

Participants and Setting

- 7 childcare providers
  - 4.5-30 years of childcare experience
  - Education ranged from Associates Degree-Masters Degree

- Inclusive early childhood classrooms:
  - University based laboratory school (N = 2 childcare providers)
  - Head Start center (N = 5 childcare providers)

- Class size: 12-18 children

- All classrooms served children with or at-risk for language delays

Method

Data Collection
- Video and audio recorded samples of teacher-child interactions
- Samples collected during centers or free-choice playtime
- Samples ranged from 15-20 min (M = 19:39 min)
- 16 total samples analyzed (minimum of 1 sample per teacher, range of 1-4 samples per teacher)

Coding
- Teacher utterances coded using adapted operational definitions from the *Code for Interactive Recording of Children's Learning Environments* (CIRCLE, Atwater et al., 2014)
- Video samples coded by 4 different coders, each utilizing a different measurement system:
  - **TER**: Every teacher utterance recorded and categorized
  - **MTS**: Teacher utterance recorded and categorized only if she was actively speaking at the end of each interval (5 s)
  - **PIR**: Teacher utterance recorded and categorized if speaking at any point during the interval; language categories not mutually exclusive
  - **Duration:** Beginning and end of every teacher utterance marked

| Language Stimulating	Expansion, repetition, and recast
	Open-ended questions
	Related comments
	Language prompt/Time delay
Non-language stimulating	Praise (general and specific)
	Negative feedback
	Giving procedural information
	Requests for action
	Reciting
	Singing
	Vocalizations
	General conversation
	Unrelated Comment

Analysis
- Each MTS and PIR file compared to the corresponding TER and duration file
- Comparisons across measurement systems:
  - Total utterances
  - Quality of language (proportion of utterances coded as language stimulating)
  - Duration of child directed speech
  - Time to complete coding for each sample

Results: Efficiency
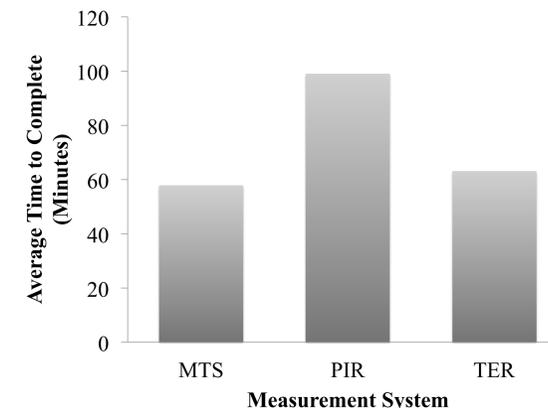
- MTS was the most efficient of the three measurement systems.
- PIR required the greatest amount of time **and** did not produce accurate estimates of the frequency of child-directed utterances.
- TER required minimally more time compared to MTS, and provided higher accuracy

Results: Accuracy of Measurement Systems

Accuracy of Frequency Estimation

Accuracy of Duration Estimation

Accuracy of Quality Estimation
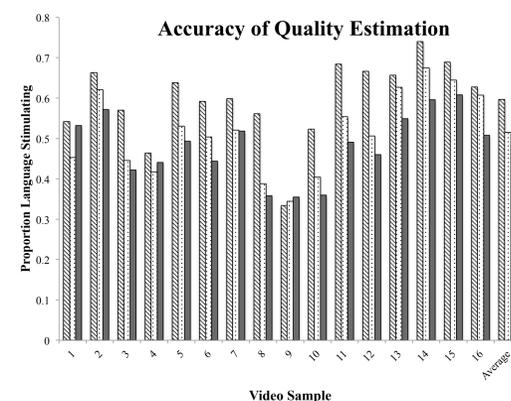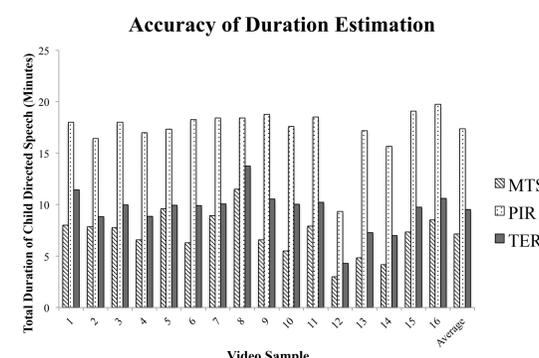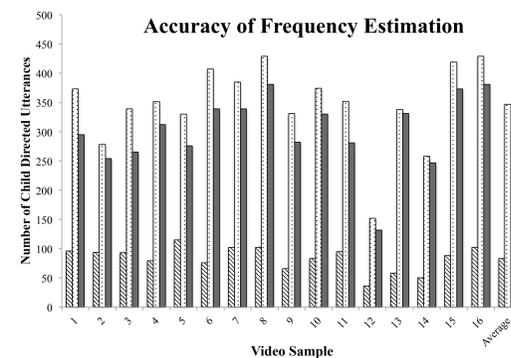
- MTS underestimated the total number of child-directed teacher utterances, capturing an average of only 28.04% of teacher utterances (range:17.5-41.7%)
- PIR overestimated the total number of child-directed teacher utterances, identifying 115% more utterances as compared to TER (range 102-128%).
- PIR was more accurate than MTS in estimating overall language quality (average discrepancy of 0.03 vs. 0.12 respectively), though both systems provided more accurate estimates quality of language as compared to frequency of language.
- MTS provided a more accurate estimate of duration of teacher speech than PIR (on average a discrepancy of 2.4 minutes vs. 7.8 minutes)

Conclusions

- Discontinuous measurement systems did not provide consistently accurate estimates of the **frequency** of teacher language
- Both estimates of **quality** of teacher language were more accurate than frequency, however systematic errors were still evident.
- Findings related to **frequency and duration** align with previous work regarding the accuracy and efficiency of MTS and PIR in classroom-based measurement contexts (Lane & Ledford, 2014).
- Researchers interested in examining frequency of teacher language input in classroom contexts should consider the loss of accuracy associated with the use of discontinuous measurement systems.
- TER did not take considerably more time to complete compared to MTS and PIR, however this study focused solely on one feature of teacher-child interactions; efficiency finding may not be replicated if the goal is to measure child, teacher, and classroom features simultaneously.

Acknowledgements