Observe Less, Learn More: Can We Use AI to Make Data-Driven Decision-Making Feasible for Home Visitors?



Jay Buzhardt
Juniper Gardens Children's Project

Infant & Toddler IGDIs

EARLY HEAD START

KU JUNIPER GARDENS CHILDREN'S PROJECT
Life Span Institute

Thank you…

- *Other PIs/Scientists:*

  Dale Walker, Judith Carta, Charles Greenwood, Brian Boyd, Dwight Irvin, Waylon Howard Nikki Grasley-Boy, Fan Jia, Scott McConnell, Jessica Steinbrenner, Howard Goldstein

- *Research Staff and App Developers:*

  Susan Higgins, Bryan Cisler, Kyle Consolver, Mallory Keller, Lashanna Brunson, Sara Diaz de Villegas, Julia Leonard, Christine Muehe, Myles Reisig, Deb Montagna

- *Families and community programs around the country that have helped inform the development of these tools*

ies INSTITUTE OF EDUCATION SCIENCES

IDEAs that Work
Office of Special Education Programs

NIH
National Institutes of Health

Over the next few minutes…

- Describe technology that uses child data to drive data-driven decision making for home visitors
- Challenges in adopting data-driven practices
- Current progress in our efforts to use commercial Large Language Models to automatically score child assessments
- Realworld challenges and ethical considerations



Why Do We Need Progress Monitoring in Home Visiting?

Progress monitoring is essential for data-driven decision making

- Repeated assessment allows providers to determine
  - When intervention is needed
  - Whether children are responding to intervention
- When progress is insufficient, providers can individualize evidence-based practices (EBPs) to better meet children's needs
- Progress monitoring is a DEC Recommended Practice in early intervention

One Progress Monitoring Measure: The Early Communication Indicator

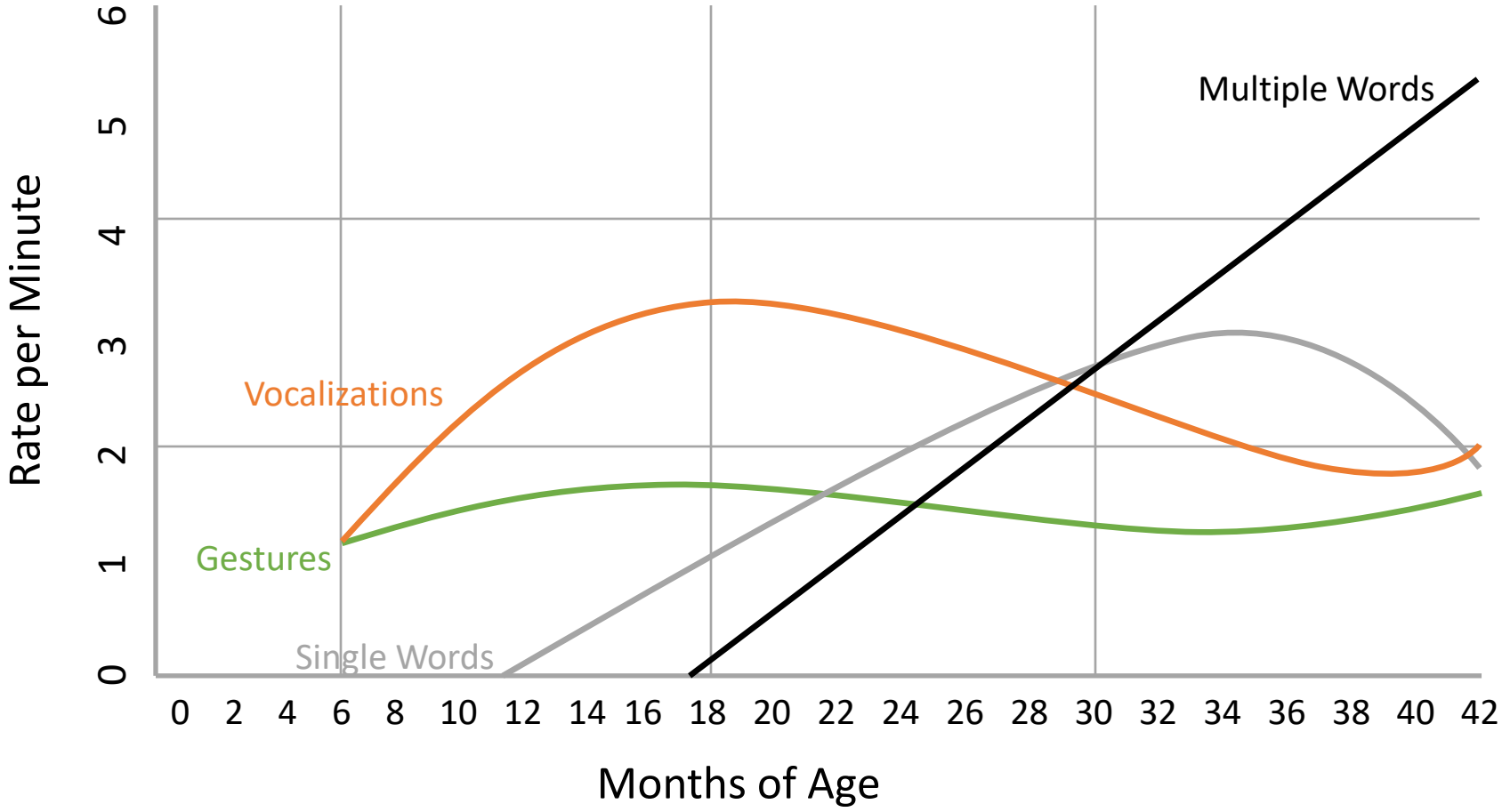


General Outcome: The child uses non-verbal communication, sounds, words, or sentences to convey wants and needs or to express meaning to others.

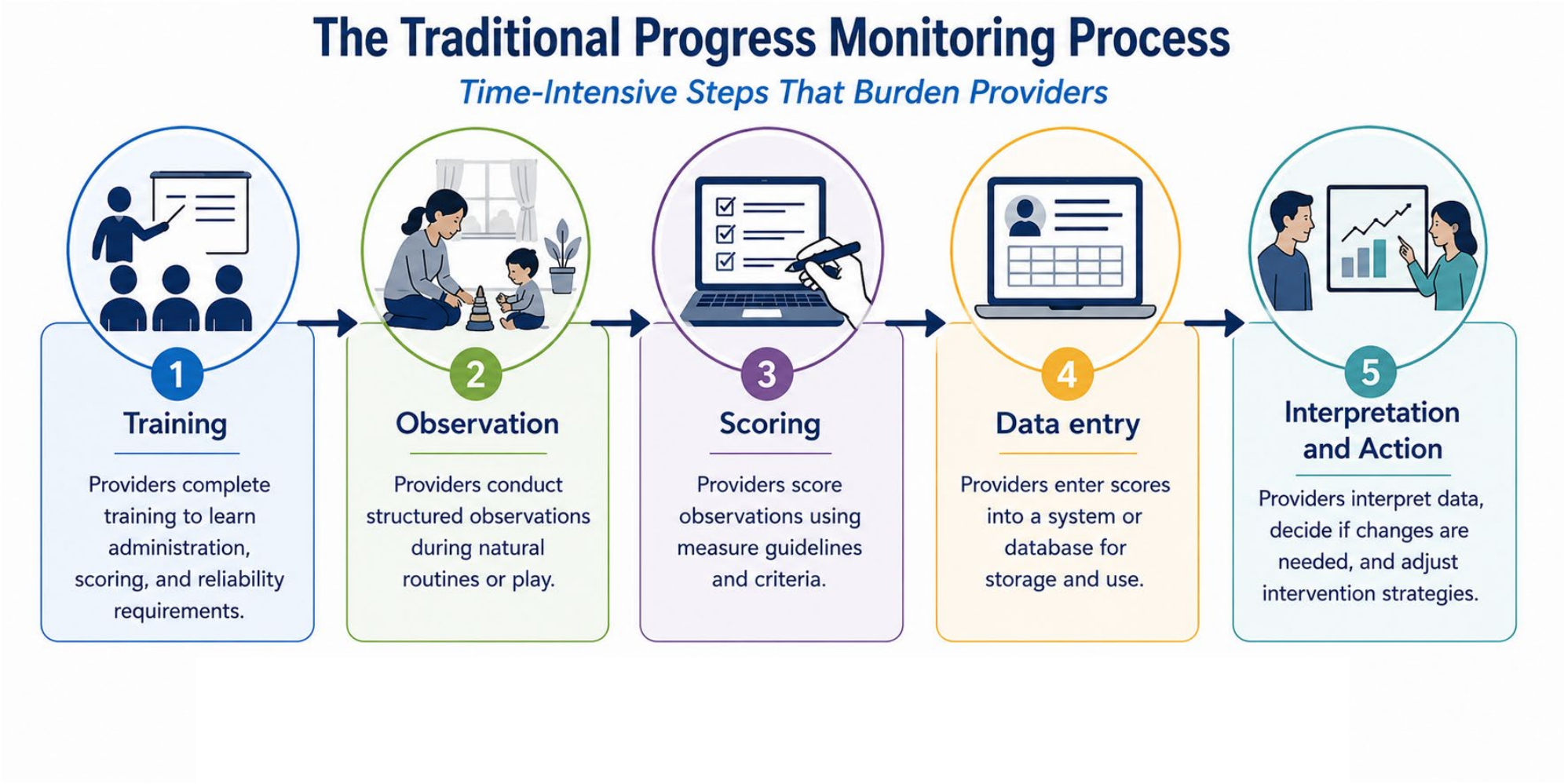
Pre-linguistic Communication → Spoken Language



The Early Communication Indicator (ECI): Key Skill Normative Trajectories



Collecting and interpreting data is difficult and burdensome

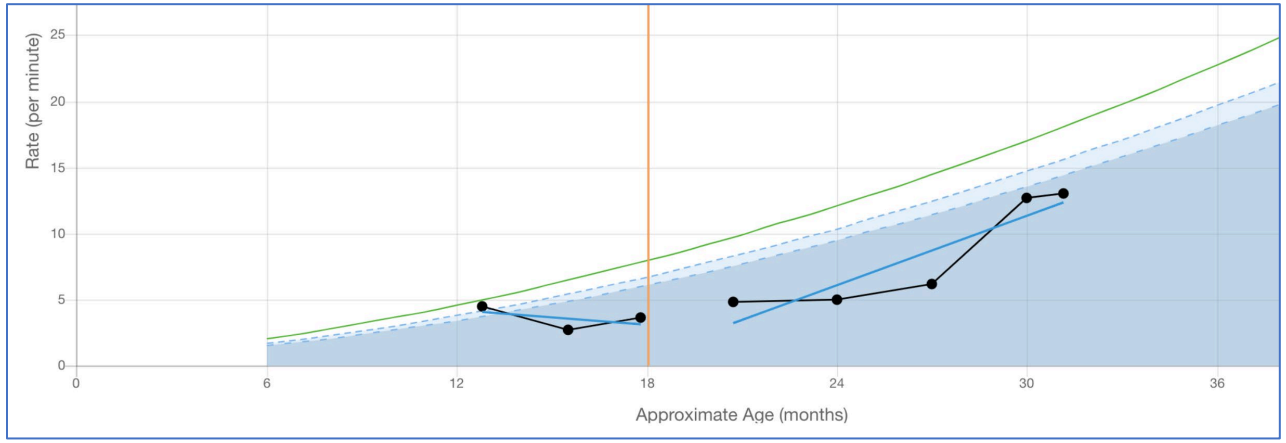


The IGDI Web Platform Helps Home Visitors Interpret Scores and Take Action



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igdi.ku.edu



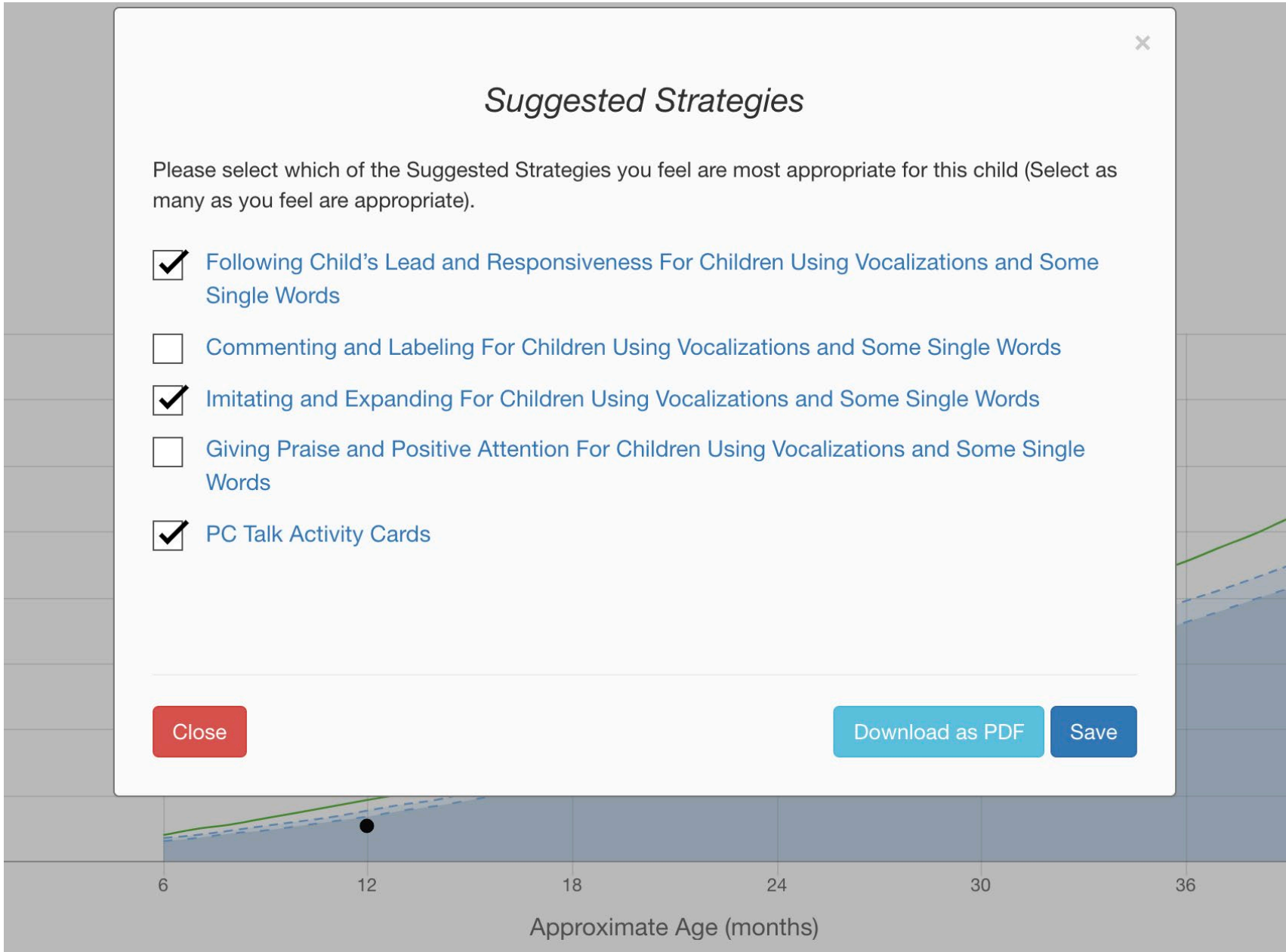
- ECI is administered with child
- Certified assessor codes the ECI key skills
- Enters the scores into the IGDI web platform
- Web platform plots scores on a graph
- Strategies recommended for children below benchmark

Algorithms Suggest Evidence-based Parent-mediated Strategies Based on Child's ECI Scores

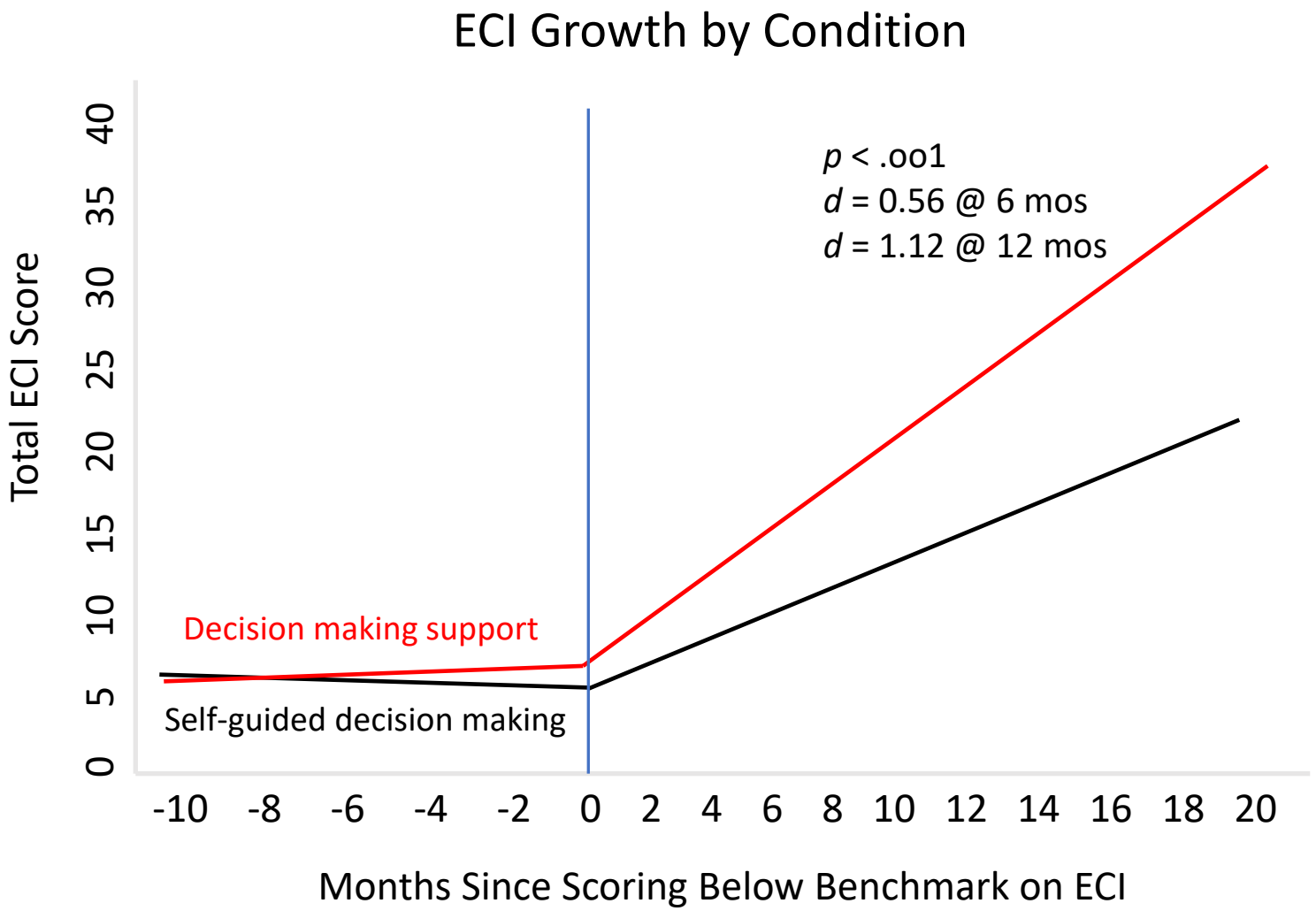




http://www.talk.ku.edu/



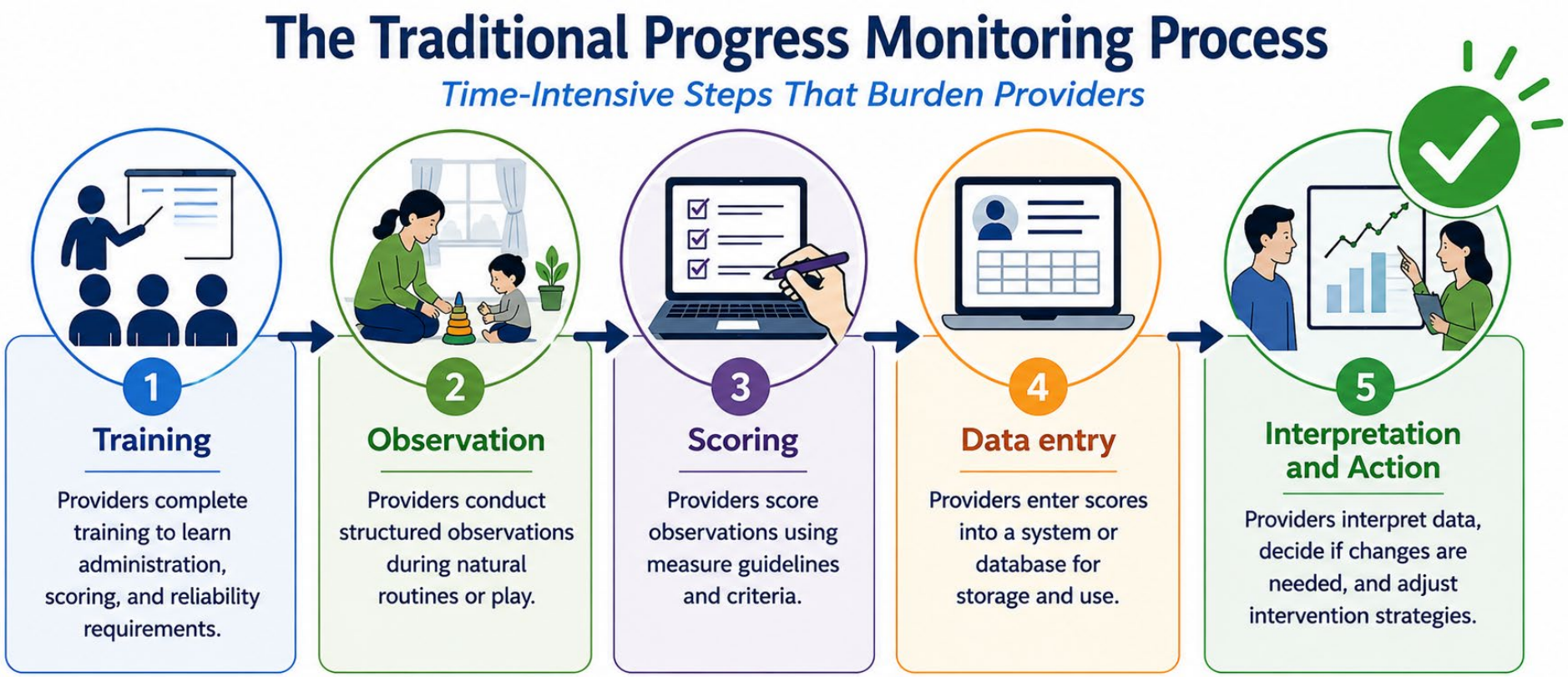
What was the effect of the system on children's growth in communication?



- RCT across four midwestern states
- Early Head Start home visiting programs
- Home visitors randomized to receive decision making support, or not
- Decision making support led to
  - Increased use of parent strategies
  - Greater growth of child communication
- Recent RCT in center-based programs had similar outcomes

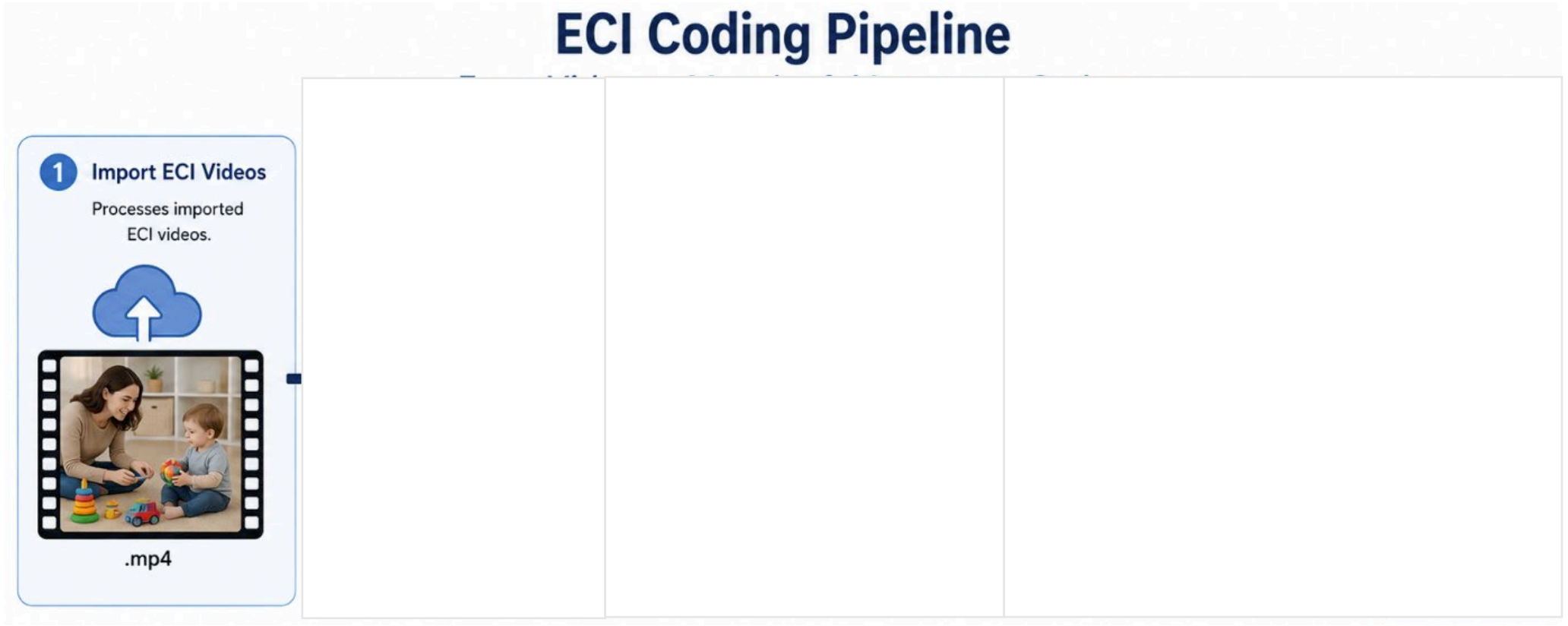
Buzhardt, J., Greenwood, C., Jia, F., Walker, D., Schneider, N., Larson, A., Valdovinos, M., and McConnell, S. (2020). Technology to Guide Data-driven Intervention Decisions: Effects on Young Children at Risk for Language Delay. *Exceptional Children.* Doi: 10.1177/0014402920938003

This took care of the last step, but…



Automated coding of the ECI

- Awarded an internal grant through KU to demonstrate proof-of-concept to customize an LLM to machine code ECIs recorded with smartphones

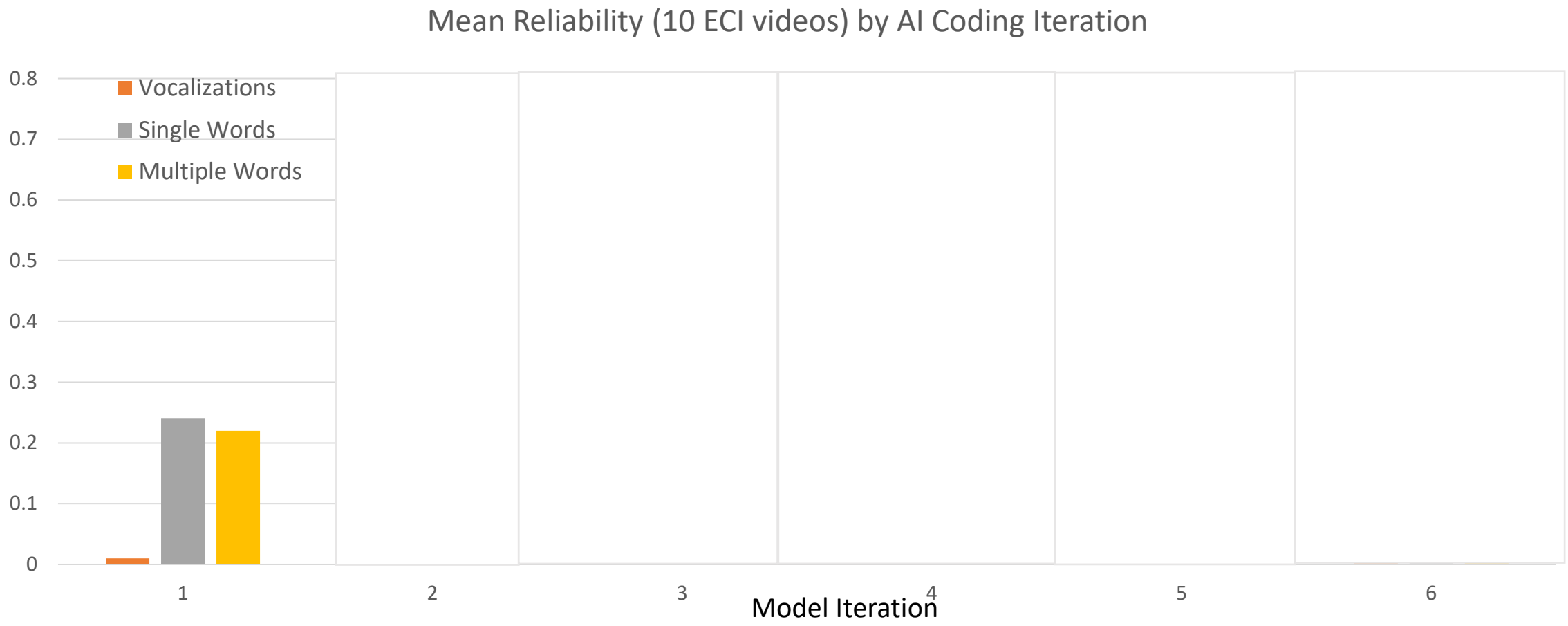


How did we measure performance of the coding system?

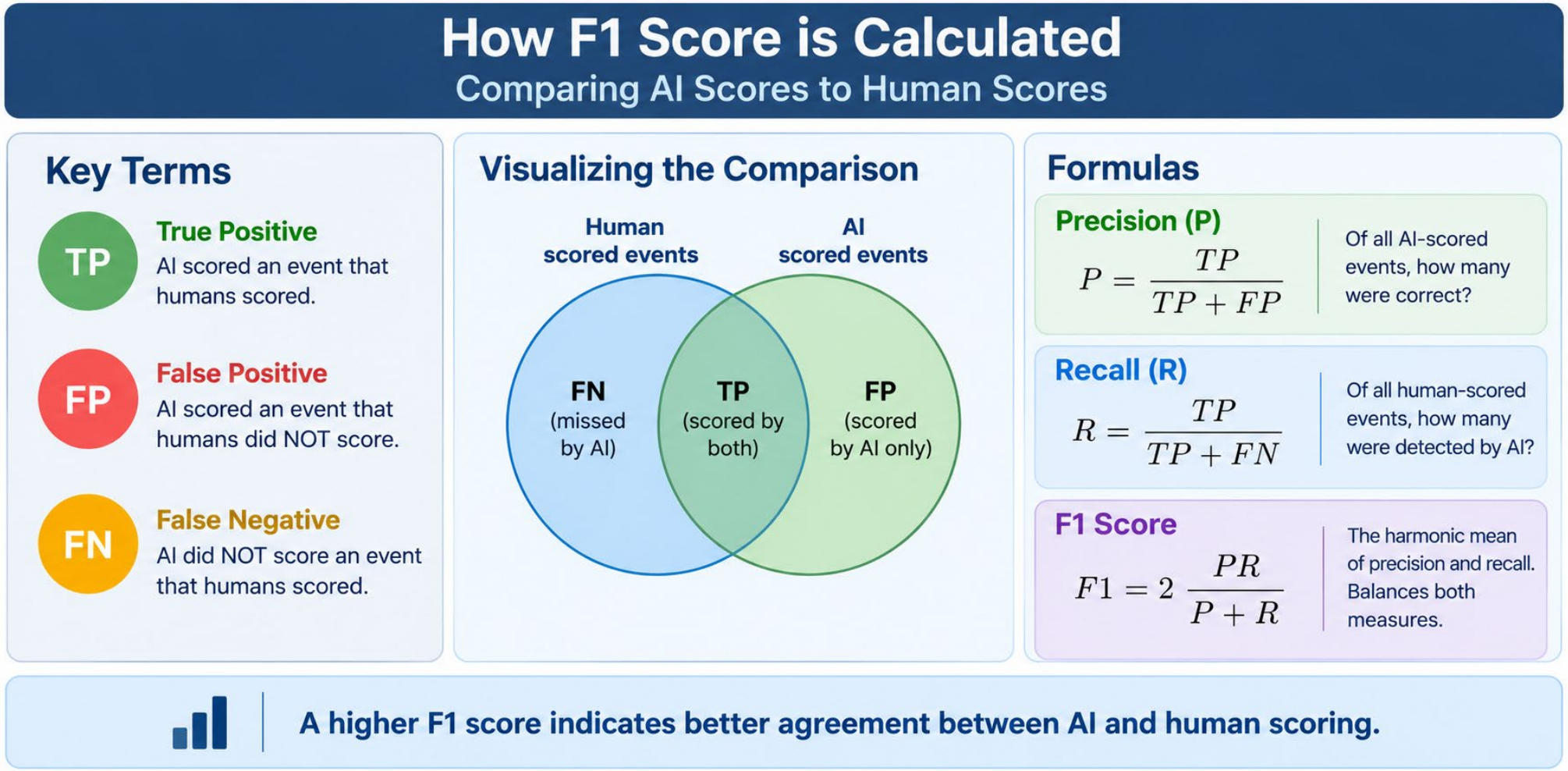
- Commercial LLMs have been trained on adult speech
  - By default, infant-toddler voices are coded as ‘noise’, so poor reliability and validity
  - Rigorous measurement of **performance and iterative customization** are critical
- Tested performance with ‘ethically sourced’ ECI videos
  - 10 videos from local Early Head Start program
  - 5 ‘held-out’ videos to test final version
  - All videos scored to consensus by lead ECI trainers (gold standard)
- Inter-rater reliability (AI vs human coding)
- Precision, recall, and F1



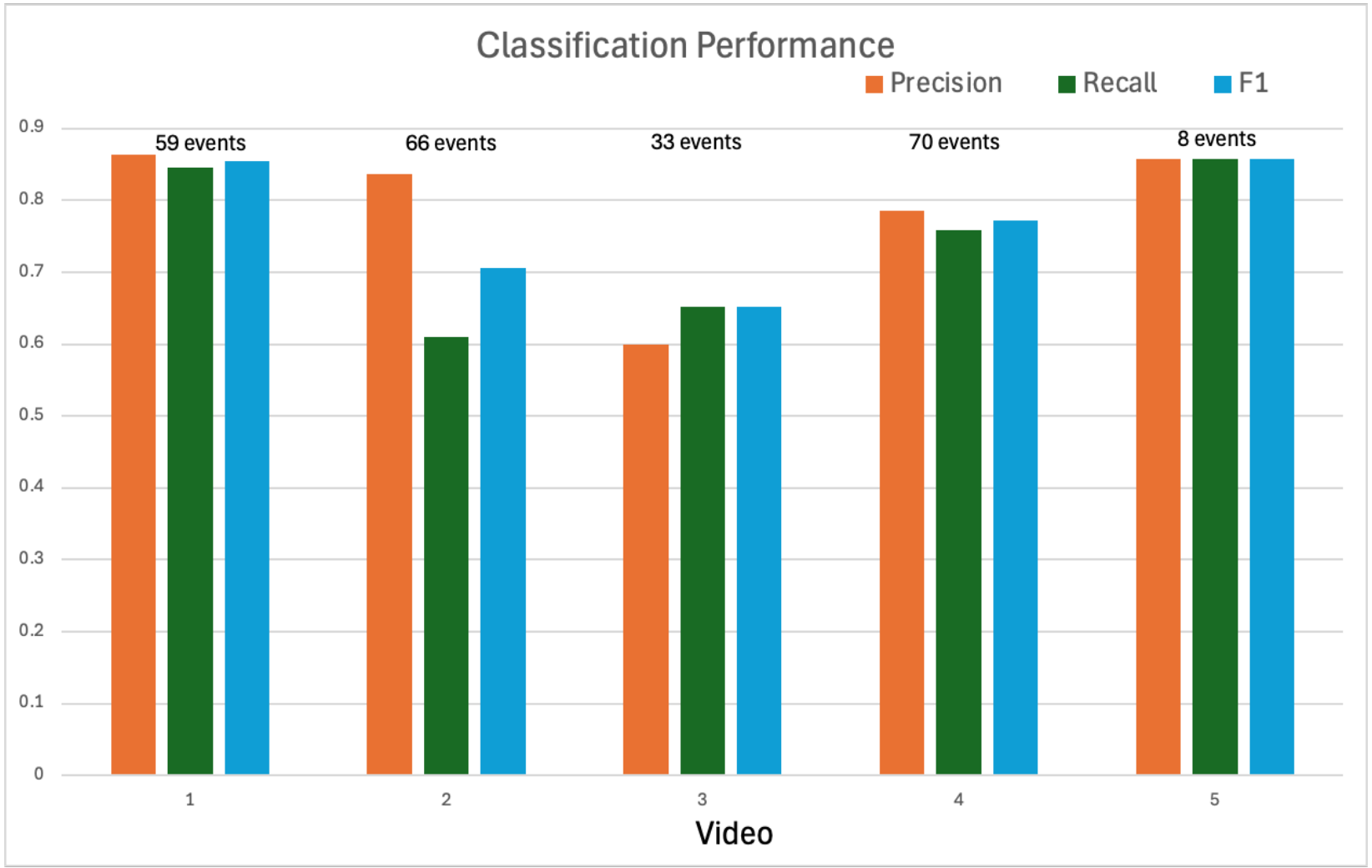
Inter-rater reliability improvement by key skill



F1 (precision & recall) – Held out set of 5 ECIs



F1 (precision & recall) – Held out set of 5 ECIs



Challenges and Future Directions

- Requires high-quality, low-noise videos in English or Spanish
  - Not always feasible in homes and classrooms
  - Need to improve performance with noisy videos
- Some families may not want child videos analyzed by commercial AI systems
  - What if families do not consent to AI scoring?
- Use of AI is not without costs
  - Fees for using compute, environmental costs
- Are there ancillary benefits that home visitors lose by not scoring their own assessments?

Questions?



https://igdi.ku.edu

Email me:
jaybuz@ku.edu