

ISSUES CONCERNING
ESTIMATING COUNT
FROM INTERVAL-BASED OBSERVATION

INTERVAL-BASED OBSERVATION

- Most common to use session-based continuous direct observation in educational settings (e.g., event-recording)
- Critical behaviors in early childhood settings might be difficult and not feasible to quantify using these
- Interval-based observation procedures
- *Estimating* the occurrence

INTERVAL-BASED OBSERVATION

- Registered responses can be considered as estimates to which the behavior actually occurred
- Whole interval recording (WIR)
 - The observer marks a behavior as present if it occurs throughout the entire interval
- Momentary time sampling (MTS)
 - The observer marks a behavior as present if and only if the behavior occurs at the boundary of the interval (e.g., the end of the interval)
- Partial interval recording (PIR)
 - The observer marks a behavior as present if the behavior occurs anytime during the interval

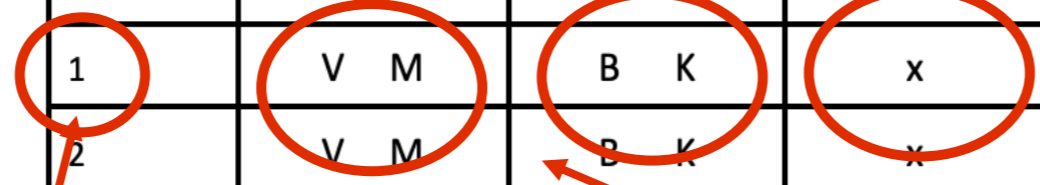
INTERVAL-BASED OBSERVATION

- More common to use to estimate *duration* of behaviors
- Estimate *count*
- Quantified through observation, by identifying the number of times they occur
- Previous research has shown that PIR estimates are inaccurate for count, **but**
- PIR is better than MTS or WIR for estimating count for behavior with relatively **short durations**
 - E.g., confirmative feedback, vocally disturbing behavior

PAX GOOD BEHAVIOR GAME

- Evidence-based classroom management program
- 10 kernels/tools implemented by the teachers
- The 10th tool is the Good Behavior Game
- Improving skills, e.g. self-regulation, resilience, and cooperation

Distraherende atferd V = Vokalt M = Motorisk Ingen = Ikke observert		Lærerens interaksjon B = Bekreftende K = Korrigerende Ingen = Ikke observert		Off task x = Ikke observert	
Intervall	Distr. atferd	Interaksjon	Off task	Kommentar	
1	V M	B K	x		
2	V M	B K	x		
3	V M	B K	x		
4	V M	B K	x		
5	V M	B K	x		
6	V M	B K	x		
7	V M	B K	x		
8	V M	B K	x		
9	V M	B K	x		
10	V M	B K	x		
11	V M	B K	x		
12	V M	B K	x		
13	V M	B K	x		
14	V M	B K	x		
15	V M	B K	x		
16	V M	B K	x		
17	V M	B K	x		
18	V M	B K	x		
19	V M	B K	x		
20	V M	B K	x		



Last 3 sec

First 12 sec

Session: 5 min

TOTAL: 20 intervals

INTERVAL: 15 sec

10 sessions in a week

OVER- AND UNDERESTIMATING OCCURRENCES

- Problems with interval-based systems of observation
- Even when PIR is estimating count, errors occur when more than one event occurs in an interval
- For behaviors of short-duration, multiple occurrences of the target behavior will occur more often when
 - a) intervals are long
 - b) the rate of the target behavior is high

OVER- AND UNDERESTIMATING OCCURRENCES

- Many behaviors in educational settings might occur clustered in time
- When PIR is used to quantify count, a single occurrence will be recorded
 - Even when multiple instances of the behavior occurs
- The use of PIR will result in a lower estimate than the actual occurrence

ILLUSTRATION OF ACCURACY FOR LONG-DURATION BEHAVIORS

- **Long duration behaviors**
 - Behaviors that occur for at least a few seconds at a time
 - On-task behavior
 - Engaging in play with peers
- **Short duration behaviors**
 - Behaviors that occur for less than a second
 - The time it takes for the behavior to occur is generally not of interest
 - Corrective feedback from teachers
 - Vocally disturbing behavior

ILLUSTRATION OF ACCURACY FOR LONG DURATION BEHAVIORS

Time in Seconds	5 s					3 s			16 s												Continuous	Count	Duration (Percent)													
PIR (2 s intervals)	-	-	+	+	+	-	-	-	-	+	+	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-	-	-	PIR	14	47%
WIR (2 s intervals)	-	-	-	+	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	-	-	-	-	-	WIR	10	33%	
MTS (2 s intervals)	-	-	-	+	+	-	-	-	-	-	+	+	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	-	-	-	-	-	MTS	12	40%	

Time in Seconds	5 s				3 s			16 s												Continuous	Count	Duration (Percent)
PIR (5 s intervals)	-	+	+	-	+	-	-	+	+	+	+	-	-	Continuous	3	24 s (40%)						
WIR (5 s intervals)	-	-	-	-	-	-	-	+	+	+	-	-	PIR	7	58%							
MTS (5 s intervals)	-	+	-	-	-	-	-	+	+	+	-	-	WIR	3	25%							
													MTS	3	25%							

Time in Seconds	5 s				3 s			16 s												Continuous	Count	Duration (Percent)
PIR (10 s intervals)	+				+			+												Continuous	3	24 s (40%)
WIR (10 s intervals)	-				-			+												PIR	6	100%
MTS (10 s intervals)	+				-			+												WIR	1	12%
													MTS	3	50%							

Figure 5.1 Sample data depicting three occurrences of a long-duration behavior (depicted by gray fill), and the estimates of count and duration when partial interval recording, whole interval recording, and momentary sampling are used with 2-, 5-, and 10-second intervals.

ILLUSTRATION OF ACCURACY FOR SHORT DURATION BEHAVIORS



Figure 5.2 Sample data depicting 12 occurrences of a short-duration behavior (depicted by gray fill), and the estimates of count and duration when partial interval recording, whole interval recording, and momentary sampling are used with 2-, 5-, and 10-second intervals.

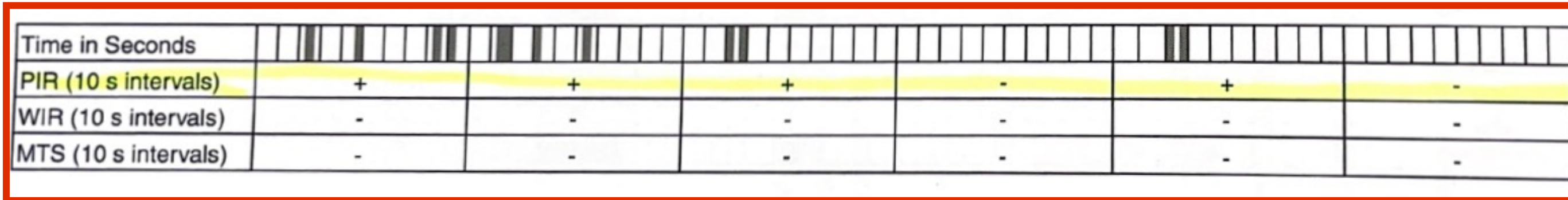
POISSON CORRECTION

- Poisson correction to improve the accuracy for estimating counts
- Can only be used when the number of intervals *in which a behavior onset occurs* is recorded
- PIR

POISSON CORRECTION

$$-\ln\left(\frac{\#non\ occurrence\ intervals}{total\ \#intervals}\right) \times \left(\frac{session\ duration}{interval\ duration}\right)$$

ILLUSTRATION OF ACCURACY FOR SHORT-DURATION BEHAVIORS



Continuous	12	4 s (7%)
PIR	4	67%
WIR	0	0%
MTS	0	0%

	# non-occurrence intervals	Total # intervals	Session duration	Interval duration	Poisson corrected
Ledford	2	6	10	60	6,591673732

POISSON CORRECTION

- Most common to use session-based continuous direct observation in educational settings
- PAX GBG-research with interval-based observation procedures
- More accurate counts of behavior using session-based continuous direct observation
 - More difficult and not feasible
- Using Poisson correction to increase the accuracy of count estimation of behaviors of short duration

SHORT DURATION BEHAVIORS

- Verbal and/or motoric disruptive behaviors
- Corrective and/or confirmative feedback
- PIR
 - 12-second interval
- Reported as estimated number of intervals (count) with correction
- Might underestimate the true count for short duration behaviors
- Use the Poisson correction to increase the accuracy of count estimation

LONG DURATION BEHAVIORS

- Off-task behavior
 - MTS
 - Short-intervals (2-3 s)
 - Reported as estimate percentage duration
 - Acceptable estimates for long duration behaviors
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- If the behavior occurs for longer than the interval length, that is not a problem
 - We could possibly underestimate the duration of the behavior

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