

MICHIGAN STATE UNIVERSITY

RADD LAB
Research in Autism and Developmental Disabilities

RADD

Response Time of Children with Complex Communication Needs Following a Communication Opportunity: A Survival Analysis

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A LITTLE BIT MORE ABOUT ME

- Tiantian Sun (孙甜甜), M.A.E., PhD Candidate
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- Research Interests:
 - Language, communication, and early literacy intervention for young children with CCN
 - Measurement of language and communication skills
 - Children with CCN and their families from culturally and linguistically diverse background



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BACKGROUND

- Approximately 12% of children at **early intervention settings** have complex communication needs (CCN) (Binger & Light, 2006) and could benefit from the use AAC.
- Children with CCN **need more time to process, initiate, and formulate a respond** when communicating with others (Millar et al., 2006).
- 2-3s "Awkwardness limen" (Mathis et al., 2011).
- Without intentional **waiting**, communication are often dominated by communication partners (Biggs et al., 2018).
- Wait time employed in previous intervention studies vary across **3s** (e.g., Coleman & Xu, 2020) to **20s** (e.g., Simpson & Keen, 2010).




Mia2 M5ium models the AAC system to comment on the shape of the Play-Doh

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How long should we really wait?
And why?


It depends on how long it takes a child to respond



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BACKGROUND

- Individual difference: heterogenous population (Lund et al., 2017)
- Response time patterns may differ across contexts
 - Comments, questions, and choices (Douglas et al., 2013)
 - Aided AAC Modeling: support expressive communication (Biggs, Carter, & Gilson, 2018)
- Previous # of communication opportunities without a child response



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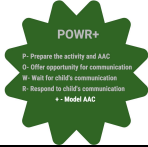
RESEARCH QUESTIONS

- RQ1: What are the overall patterns of child response time?
- RQ2: Does the pattern of child response times differ across
 - (a) child individuals
 - (b) type of communication opportunities (questions, comments, or choices)
 - (c) modeled opportunities vs. non-modeled opportunities
- RQ3: Previous # of communication opportunities without a response (nonresponse)

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PROCEDURES


- Observational data from a larger single case design study
- Baseline** → Online POWR Training → **Intervention Phase 1** → POWR+ Training → **Intervention Phase 2** → **Maintenance**
- 16-28 week period**

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PROCEDURES

- Participants: **5 paraeducator-child dyads**
- Age: 3-5 years old
- AAC Systems: PECS, Core board, Simple SGD, VOCA
- Diagnoses: ASD, developmental delay, DiGeorge syndrome, speech delay
- Setting: A separate room in preschool
- Activities: Child's favorite play activities
- N = 16-20 observational sessions
- N = **6515** communication turns were analyzed



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MEASURES

- Child communication events** (0=not occur; 1= occur)
- Response time:** time between
 - (1) a communication opportunity and child communication
 - (2) two communication opportunities
- Communication opportunities**
 - Types of communication opportunities: choice, question, comment
 - Model vs non-model
 - # of previous consecutive nonresponses

Question: What do you see?

Choice: Do you want the bubble or the puzzle?

Comment: Nice job helping the farm animals!

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SURVIVAL ANALYSIS

- Survival Analysis examines the time to event (child response time) (Tabachnick & Fidell, 2013).
- How long it takes for child response to happen?
- Survive: Child does not respond
- Hazard: Child responded

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RQ1: OVERALL RESPONSE TIME PATTERNS

- Median response time was 1.87s (50%).
- The probability of responding to a communication opportunity at 5s became low
- The probability of responding to a communication opportunity after 7s was close to 0.

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Interval Start Time	Number Entering Interval	Number Withdrawing during Interval (# of nonresponse)	Number of Terminal Events (# of response)	Proportion Terminating	Proportion Surviving	Cumulative Proportion Surviving at End of Interval
0	6515	0	2875	.44	.56	.56
1	3640	0	429	.12	.88	.49
2	3201	798	176	.06	.94	.46
3	2227	620	87	.05	.95	.44
4	1520	357	51	.04	.96	.42
5	1112	283	19	.02	.98	.41
6	810	155	16	.02	.98	.41
7	639	134	21	.04	.96	.39
8	484	97	6	.01	.99	.39
9	381	66	8	.02	.98	.38
1	307	36	5	.02	.98	.37
11	246	37	1	.00	1.00	.37
12	208	39	3	.02	.98	.36
13	166	43	3	.02	.98	.35
14	120	18	1	.01	.99	.35
15	101	18	1	.01	.99	.35
16	82	14	3	.04	.96	.33
17	65	7	1	.02	.98	.33
18	57	8	0	.00	1.00	.33
...
39	1	0	0	.00	1.00	.23
40	1	0	0	.00	1.00	.23
41	1	1	0	.00	1.00	.23

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RQ2(A): INDIVIDUAL DIFFERENCES

- Participant A, B, C, D, E
- There were individual differences in response time. ($\chi^2(4)=1336.95, p < .001$).

The plot shows cumulative survival on the y-axis (0.0 to 1.0) and time in seconds on the x-axis (0 to 50). Five curves represent participants A through E. Participant A (red) drops to 0.0 survival by 10 seconds. Participant B (green) drops to 0.0 by 20 seconds. Participant C (blue) drops to 0.0 by 30 seconds. Participant D (yellow) drops to 0.0 by 40 seconds. Participant E (orange) drops to 0.0 by 50 seconds.

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RQ2(B): TYPES OF COMMUNICATION OPPORTUNITIES

- Choice, Questions, & Comments
- Children take shorter time to communicate following a choice (Mdn=6.03s) or a question (Mdn=6.56s), both were significantly shorter than following a comment (Mdn=9.38s).

The plot shows cumulative survival on the y-axis (0.0 to 1.0) and time in seconds on the x-axis (0 to 50). Three curves represent different communication opportunities: Choice (blue), Question (red), and Comment (green). Choice and Question curves drop to 0.0 survival by approximately 10 seconds. The Comment curve drops to 0.0 survival by approximately 30 seconds.

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RQ2(C): AIDED AAC VS. NON-MODELING

- Modeling vs. Non-modeling
- Modeling was associated with shorter response times ($\chi^2(1)=115.77, p < .001$; Mdn-model=0.77s; Mdn-no-model= 2.42s).

The plot shows cumulative survival on the y-axis (0.0 to 1.0) and time in seconds on the x-axis (0 to 50). Two curves represent different modeling conditions: Modeling (red) and Non-modeling (blue). The Modeling curve drops to 0.0 survival by approximately 5 seconds. The Non-modeling curve drops to 0.0 survival by approximately 15 seconds.

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RQ3: # OF PREVIOUS NONRESPONSE

- Cox regression
- If the child does not respond to a communication opportunity, additional opportunities are associated with longer response times.

	Step 1		Step 2		Step 3	
	B	SE	B	SE	B	SE
Child ID	-.35**	.01	-.31**	.012	-.22**	.013
Types of opportunities			-.55**	.031	-.52**	.031
Model vs. Non-model			.09*	.044	.06	.044
# of nonresponse					-.183**	.011
χ^2	885.76**	df=1	1206.64**	df=3	1375.16**	df=4
$\Delta\chi^2$	N/A		308.66**	df=2	474.96**	df=1

Notes: *p<.05, ** p<.001

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IMPLICATION FOR PRACTICE

- Typically, wait 5-7s when talking with your child, even when making a comment.
- Count saliently: 1 Mississippi, 2 Mississippi, 3 Mississippi, 4 Mississippi, 5 Mississippi... (this feels REALLY long...)
- But remember, there are **individual differences**, some children require shorter wait time, others require longer
- If the child does not respond, **providing additional opportunities repeatedly within short breaks does not help** the child to communicate faster. ❌
 - Consider the reasons why the child did not respond ✅
 - Providing sufficient wait time ✅
 - Change the nature of communication opportunities (e.g., questions & choice with AAC modeling) ✅
- Provide **motivating activities** to help keeping the child's attention ✅

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Discussion Questions: Research Implications

- What **surprised** you?
- How to **individualize wait time**?
- How do you expect the results being generalized to other population?
- In addition to choice, question, comment, and AAC modeling, what are other aspects of communication opportunities that may influence the child response patterns?

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General Discussion Questions

- What are some things we can do **disseminate research to practice**:
 - helping practitioners recognize the benefits of AAC
 - know who could benefit from AAC
 - know how to support communication through AAC at different settings
- How **to recruit participants** from culturally linguistically diver background?
- What are some things we can do to **find collaborators** and **start collaborations**?

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