

Supplemental Material S1.

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S1.1 Detailed Description of Assessment Battery

1. Child and family characteristics. Caregivers completed a health and demographic

questionnaire about their family and child to gather information on the child’s functional impairment, disability diagnosis, medical history, race, ethnicity, intervention services received, and the caregiver’s educational history, employment status, home language use, and socioeconomic status. Health information and community services were updated monthly to monitor changes in number of hours of intervention as well as major health events that could affect the outcomes of the study.

2. Developmental Assessments. The Mullen Scales of Early Learning (MSEL; Mullen, 1995)

was administered to assess the children’s overall developmental skills including expressive and receptive language, motor skills, and visual perceptual ability. Age-equivalency scores from the Visual Reception subscale were used to determine eligibility for the study. To qualify, child participants had to receive scores equivalent to 18 mos. The MSEL has high criterion-related validity with other assessments of nonverbal intelligence and language, including the Bayley Scales of Infant Development ($r = 0.70$). The Structured Play Assessment (SPA; Ungerer & Sigman, 1981) was administered to measure the children’s developmental play skills. During the SPA, the child and interventionist sat facing each other while the interventionist presented five standard toy sets including: (1) puzzles, nesting cups, and blocks; (2) babies, a mirror, a brush, and a toy telephone; (3) babies, cups, plates, utensils, and play-food; (4) dolls, doll furniture, doll linens, and tissue paper; (5) a barn, animals, a farmer, blocks, and a dump-truck. SPA administration lasted approximately 15 – 20 minutes. The frequency, type, and level of spontaneous play acts were coded from the video recorded interactions. Scores for the highest and most frequent spontaneous play level

were used to describe participants. Caregivers completed the Child Behavior Checklist (CBCL; Achenbach, & Rescorla, 2000) to measure the children’s internalizing, externalizing, and overall problem behaviors. T scores for total problem behavior, internalizing, and externalizing behavior were calculated to describe participants. The CBCL has test-retest reliability of $r = 0.85$ and has criterion-related validity with the Infant Toddler Social and Emotional Assessment (ITSEA, Briggs-Gowan & Caret 1998) of $r = 0.46 - 0.72$ for externalizing scales and $r = 0.48 - 0.62$ for internalizing scales (Achenbach & Rescorla, 2000).

- 3. Language Assessments.** Caregivers completed the MacArthur-Bates Communicative Development Inventories: Words and Gestures (MCDI; Fenson et al., 2007) to describe their child’s understanding and use of early gestures and receptive and expressive vocabulary. Scores for the number of total words understood and produced and the number of verbs understood and produced were summarized to describe participants. The internal consistency of this measure is $r = 0.96$ and the test-retest reliability is $r = 0.80$ (Fenson et al., 2007). The Preschool Language Scales – 5th Edition (PLS-5; Zimmerman, et al., 2011) was administered to evaluate the children’s receptive and expressive language skills. Total scores were calculated to determine study eligibility. The internal consistency of this measure ranges from $r = 0.85 - 0.94$ and test-retest reliability ranges from $r = 0.83 - 0.93$ depending on child age (Zimmerman et al., 2011). Split half reliabilities range from $r = 0.80 - 0.97$. Sensitivity for the total language score is $r = 0.83$ and specificity is $r = 0.80$ (Zimmerman, et al., 2011). The PLS-5 has a high degree of criterion-rated validity with the previous version—PLS-4 (adjusted $r = 0.85$) and the Clinical Evaluation of Language Fundamentals-Preschool – 2 (adjusted $r = 0.79$). A structured language sample was administered to evaluate the children’s

expressive communication and language skills. During the language sample the child and interventionist sat facing each other while the interventionist presented six different toy sets including (1) babies (e.g., play food, kitchen utensils, cups, and plates), (2) play dough (e.g., playdough, cookie cutters, stamps, rolling pins, scissors, and playdough press), (3) bubbles (e.g., large and miniature bubble containers), (4) a farm (e.g., barn, wind-mill, blocks, animals, little people, tractor, and crops), (5) cars (e.g., vehicles, car ramp, and garage elevator), and (6) a picture book (e.g. *Where's spot?*, *Spot's snowy Day*). Language sample administration lasted approximately 20 minutes. The rate of spontaneous communication acts, mean length utterance, and number of different words communicated were coded from the videotaped interactions.

S1.2. Time Delays and Milieu Teaching Episode Scoring Procedures

Time Delay Scoring Guidelines
Outstanding Performance [td3]
<p>The caregiver demonstrates a high quality Time Delay. The caregiver must:</p> <ol style="list-style-type: none"> 1. Start the Time Delay naturally so that it does not disrupt play. 2. Wait for a clear request from the child before giving the object/action. 3. Give the requested object/action at the end of the Time Delay. 4. Label the object/action with a language target within one second of giving it. 5. CHOICE ONLY – present two objects that have distinctly different language targets at the child’s target level.
Not Great Teaching [td2]
<p>The caregiver demonstrates a Time Delay with one of the following issues:</p> <ol style="list-style-type: none"> 1. Does not wait for a clear request (accepts {look} only) – EXCEPT CHOICE. 2. Gives the requested object/action before using a language target.
Confusing to the Child [td1]
<p>The caregiver demonstrates a Time Delay with one of the following issues:</p> <ol style="list-style-type: none"> 1. The caregiver does not label the requested object/action with a language target OR does not repeat/expand when the child requests using a language target. 2. CHOICE ONLY - Does not wait for a clear child request (accepts {look} only). 3. CHOICE ONLY – does not present two objects that have distinctly different language targets at the child’s target level.
Punishing to the Child [td0]
<p>The caregiver demonstrates a Time Delay with one of the following issues:</p> <ol style="list-style-type: none"> 1. The time delay is NOT natural and interrupts play. 2. The caregiver does not give the requested object/action to the child at the end of the Time Delay.
Child is Not Interested [tli]
<p>The child is not interested in the object/action and the caregiver abandons the Time Delay appropriately by not giving the child the object/action.</p>

Milieu-Teaching Episodes
Outstanding Performance +[me3]
<p>The adult demonstrates a high-quality Milieu Episode. The adult must</p> <ol style="list-style-type: none"> 1. Begin the Milieu Episode naturally and in response to a <u>non-target</u> child request. 2. Prompt a language target at the child's target level. 3. Prompt the same words throughout the episode. 4. Use the correct prompting sequence. 5. Give the child adequate time to respond. 6. Stop prompting when the child loses interest, says the prompted words, or responds to an open question with a target request. 7. Give the child the prompted and requested object/action at the end of the Milieu Episode. 8. Label the object/action with the prompted language target.
Not Great Teaching +[me2]
<p>The adult demonstrates a Milieu Episode with one of the following issues:</p> <ol style="list-style-type: none"> 1. Begins the Milieu Episode at a time when the child is NOT requesting. 2. Prompts below the child's target level or using a non-target word. 3. Does not model target language when ending the episode (giving the object/action).
Confusing to the Child +[me1]
<p>The adult demonstrates a Milieu Episode with one of the following issues:</p> <ol style="list-style-type: none"> 1. Changes the prompted words during the Milieu Episode. 2. Uses the incorrect prompting sequence 3. Gives the object inappropriately or loses control of the object.
Punishing to the Child +[me0]
<p>The adult demonstrates a Milieu Episode with one of the following issues:</p> <ol style="list-style-type: none"> 1. Prompts above the proximal target level. 2. Continues prompting after the child responds with the prompted words. 3. Continues prompting after the child has lost interest in the prompted object/action. 4. Begins the Milieu Episode in response to a child <u>target</u> request. 5. Does not give the object at the end of the episode. 6. Does not give the child adequate time to respond. 7. The Milieu Episode begins in a way that is NOT natural and disrupts play.
Child Loses Interest +[mli]
<p>The child loses interest in the object/action and the adult abandons the Milieu Episode appropriately by not giving the child the prompted object/action</p>
Milieu Abandoned Correctly +[mac]
<p>The child was NEVER interested in the Milieu Episode, and the adult realizes it after ONE PROMPT and abandons the episode appropriately by not giving the prompted object/action</p>

S1.3. Reliability of Dependent Variables for EMT Strategy Use Across Conditions, Tiers, and Participants

Participant Dyad	Condition	Intervention Tiers				All Tiers
		Tier 1: Matched Turns	Tier 2: Target Talk/ Expansions	Tier 3: Time Delays	Tier 4: Milieu Episodes	
Jessica and Jameson	Baseline	89% (82 – 93%)	89% (82 – 93%)	89% (82 – 93%)	90% (82 – 96%)	90% (82 – 96%)
	Intervention	91% (87 – 96%)	91% (89 – 96%)	92% (89 – 96%)	91 (91- 93%)	91% (87 – 96%)
	Maintenance	--	--	--	--	94% (89 – 97%)
Elena and Ira	Baseline	89% (82 – 94%)	89% (82 – 94%)	91% (82 -94%)	90% (82- 94)	90% (82 – 94%)
	Intervention	90% (87 – 94%)	90% (87 – 94%)	88% (87 – 89%)	88% (87 – 89%)	90% (87 – 94%)
	Maintenance	--	--	--	--	89% (87 – 92%)
Terry and Ambyr	Baseline	94% (90 – 92%)	94% (93 – 95%)	93% (87 – 95%)	92% (87 – 95%)	92% (87 – 95%)
	Intervention	92% (87 – 95%)	91% (87 – 95%_	91% (87 – 92%)	92% (91 – 92%)	92% (87 – 95 %)
	Maintenance	--	--	--	--	95% (94 – 95%)
Sydney and Nora	Baseline	92% (89 – 93%	93% (89 – 99%)	93% (89 – 99%)	93% (89 – 99%)	93% (89 – 99%)
	Intervention	93% (90 – 93%)	92% (90 – 95%)	92% (90 – 94%)	92% (90 – 94%)	92% (90 – 95%)
	Maintenance	--	--	--	--	90% (89 – 91%)

S1.4. Reliability of Child Communication Outcomes

Percentage Agreement Child Communication Outcomes				
Participant Dyad	Condition	Communication Form	Independence	Number of Different words
Jameson	Baseline	91% (81- 100%)	88% (79 – 100%)	91% (80 – 100%)
	Intervention	91% (81-100%)	86% (80 – 94%)	90% (80 – 100%)
	Maintenance	91% (89 – 91%)	94% (88 – 100%)	89% (82 – 100%)
Ira	Baseline	88% (80 – 96%)	88% (67 – 100%)	89% (50 – 100%)
	Intervention	89% (78 – 92%)	86% (67 – 96%)	85% (50 – 100%)
	Maintenance	87% (86 – 87%)	88% (87 – 88%)	93% (85 – 100%)
Ambyr	Baseline	90 (83 – 100%)	86% (75 – 100%)	88% (67 – 100%)
	Intervention	90% (85 – 100%)	87% (75 -100%)	97% (86 – 100%)
	Maintenance	94% (87 – 100%)	91% (87- 94%)	96% (91 – 100%)
Nora	Baseline	88% (78 – 96 %)	86% (71 – 93%)	94% (67 – 100%)
	Intervention	90% (78 – 100%)	90% (71 – 100%)	100%
	Maintenance	91% (90 – 92%)	91% (90 – 92%)	92% (83- 100%)

S1.5. Procedural Fidelity Across All Phases and Participants

Phase	Jessica and Jameson Mean (Range)	Elena and Ira Mean (Range)	Terry and Ambyr Mean (Range)	Sam and Nora Mean (Range)
Baseline				
Matched turns	100%	99% (95 – 100%)	100%	100%
Target talk/ expansions	98% (95 – 100%)	99% (95 – 100%)	100%	97% (86 – 100%)
Time delays	95% (77 – 100%)	100% (95 – 100%)	97% (96 – 100%)	97% (86 – 100%)
Milieu-teaching episodes	96% (77– 100%)	99% (95 – 100%)	98% (86 – 100%)	96% (86 – 100%)
Total Baseline Sessions	97% (77 – 100%)	99% (95 – 100%)	99% (86- 100%)	97% (86 – 100%)
Intervention				
Matched turns	95% (77 – 100%)	100% (95 – 100%)	98 % (86 – 100%)	95% (86 – 100%)
Target talk/ expansions	95% (77– 100%)	99% (95 – 100%)	98% (86– 100%)	96% (86 – 100%)
Time Delays	97% (91 – 100%)	99% (95 – 100%)	97% (86 – 100%)	96% (86 – 100%)
Milieu-teaching episodes	93% (91 – 100%)	99% (95 – 100%)	100%	95% (91 – 100%)
Total Intervention	95% (77 – 100%)	99% (95 – 100%)	98% (86 – 100%)	95% (86 – 100%)
Maintenance	100%	100%	92% (68 – 100%)	100%
Overall procedural fidelity	99% (77 – 100%)	99% (95 – 100%)	97% (68 – 100%)	96% (86 – 100%)
Inter-observer agreement on procedural fidelity.	99% (95 – 100%)	99% (95 – 100%)	99% (91 – 100%)	99% (95 – 100%)

Note. Procedural fidelity was assessed for at least 33% of sessions across phases, tiers, and participants.

S1.6. Structured Visual Analysis for Percentage of Correct EMT Strategies

Tier	EMT Strategy	Baseline			Intervention			Across Conditions				
		Level	Trend	Variability/ Stability	Level	Trend	Variability/ Stability	Immediacy of changes	Overlap	Consistency of changes	Actual/ Potential	Functional Relation
Jessica and Jameson										Yes	4/4	Yes
1	Matched turns	M	NT	SV LS	H IL	AT	SV TS, LS	IC	LO		X	
2	Target talk	L-H	AT	HV	H NLC	NT	SV LS	NC	HO			
	Expansions	Z-L	NT	S LS	M-H IL	AT	SV TS, LS	IC	NO		X	
3	Time delays	Z	NT	S LS	H IL	NT	S LS	IC	NO		X	
4	Milieu-episodes	Z	NT	S LS	H IL	NT	S LS	IC	LO		X	
Elena and Ira										Yes	4/4	Yes
1	Matched turns	L	NT	S LS	H IL	AT	S TS, LS	IC	NO		X	
2	Target talk	L- M	AT	SV TS	H NLC	AT	SV TS	NC	MO			
	Expansions	Z	NT	S LS	H IL	NT	HV	IC	LO		X	
3	Time delays	L-Z	NT	S LS	H IL	NT	SV LS	IC	LO		X	
4	Milieu-episodes	Z	NT	S LS	H IL	NT	SV LS	IC	LO		X	

Note. Regarding level L= low level, M= moderate level, H = high level, IL = increase in level, DL= decrease in level, NLC= no level change, Z= level at zero. Regarding trend, AT = accelerating trend, DT = decelerating trend, NT = no trend/ zero-accelerating trend. Regarding variability, SV = somewhat variable, HV= highly variable, S= Stable, Regarding Stability = LS = level stability, TS = trend stability. Regarding immediacy, IC = immediate change, LC= latent change, NC = no change. Regarding overlap, LO= low overlap, MO= moderate overlap, HO= high overlap, NO= no overlap.

Structured Visual Analysis for Percentage of Correct EMT Strategies

		Baseline			Intervention			Across Conditions				
Tier	EMT Strategy	Level	Trend	Variability	Level	Trend	Variability	Immediacy of changes	Overlap	Consistency of changes	Actual/Potential	Functional Relation
Terry and Ambyr										Yes	4/4	Yes
1	Matched turns	M	DT	SV	H IL	NT	S LS	IC	NO		X	
2	Target talk	L-H	AT	HV	M-H DL	NT	SV S	IC	HO			
	Expansions	Z-L	NT	LV LS	H IL	NT	SV LS	IC	LO		X	
3	Time delays	Z	NT	S LS	H IL	AT	S TS, LS	IC	NO		X	
4	Milieu-episodes	Z	NT	S LS	H IL	NT	S LS	IC	NO		X	
Sydney and Nora										Yes	4/4	Yes
1	Matched turns	M	NT	S LS	H IL	NT	S TS, LS	IC	NO		X	
2	Target talk	L-H	AT	S TS, LS	H NLC	NT	S LS	NC	HO			
2	Expansions	Z	NT	S LS	H IL	NT	SV LS	IC	LO		X	
3	Time delays	Z	NT	S LS	H IL	NT	SV LS	IC	LO		X	
4	Milieu-episodes	Z	NT	S LS	H IC	AT	S TS, LS	IC	NO		X	

Note. Regarding level L= low level, M= moderate level, H = high level, IL = increase in level, DL= decrease in level, NLC= no level change, Z= level at zero. Regarding trend, AT = accelerating trend, DT = decelerating trend, NT = no trend/ zero-accelerating trend. Regarding variability, SV = somewhat variable, HV= highly variable, S= Stable, Regarding Stability = LS = level stability, TS = trend stability. Regarding immediacy, IC = immediate change, LC= latent change = LC, NC = no change. Regarding overlap, LO= low overlap, MO= moderate overlap, HO= high overlap, NO= no overlap.

Structured Visual Analysis for Number of Correct EMT Strategies

Tier	EMT Strategy	Baseline			Intervention			Across Conditions				
		Level	Trend	Variability	Level	Trend	Variability	Immediacy of changes	Overlap	Consistency of changes	Actual/Potential	Functional Relation
Jessica and Jameson										Yes	3/4	Yes
1	Matched turns	M	NT	SV LS	M	NT	S LS	IC	HO			
2	Target talk	L-M	AT	SV TS	M	AT	SV TS, LS	NC	HO			
2	Expansions	Z-L	NT	S LS	L-M	NT	SV LS	IC	NO		X	
3	Time delays	Z	NT	S LS	L	NT	S LS	IC	NO		X	
4	Milieu-episodes	Z	NT	S LS	L	NT	S LS	IC	LO		X	
Elena and Ira											4/4	Yes
1	Matched turns	M	NT	S LS	M-H	AT	S TS, LS	IC	HO		X	
2	Target talk	L-M	AT	S TS	M-H	AT	S TS, LS	NC	MO			
2	Expansions	Z	NT	S LS	L	NT	S LS	IC	LO		X	
3	Time delays	Z-L	NT	S LS	L	NT	S LS	IC	LO		X	
4	Milieu-episodes	Z	NT	S LS	L	NT	S LS	IC	LO		X	

Note. Regarding level L= low level, M= moderate level, H = high level, IL = increase in level, DL= decrease in level, NLC= no level change, Z= level at zero. Regarding trend, AT = accelerating trend, DT = decelerating trend, NT = no trend/ zero-accelerating trend. Regarding variability, SV = somewhat variable, HV= highly variable, S= Stable, Regarding Stability = LS = level stability, TS = trend stability. Regarding immediacy, IC = immediate change, LC= latent change = LC, NC = no change. Regarding overlap, LO= low overlap, MO= moderate overlap, HO= high overlap, NO= no overlap.

Structured Visual Analysis for Number of Correct EMT Strategies

Tier	EMT Strategy	Baseline			Intervention			Across Conditions				
		Level	Trend	Variability	Level	Trend	Variability	Immediacy of changes	Overlap	Consistency of changes	Actual/Potential	Functional Relation
Terry and Ambyr										Yes	3/4	No
1	Matched turns	M	NT	S LS	M	AT	SV TS, LS	IC	NO		X	
2	Target talk	L-M	AT	S TS	M	NT	SV LS	NC	HO			
	Expansions	Z-L	NT	S	LL	NT	SV LS	IC	LO			
3	Time delays	Z	NT	S	LL	MT	S LS	IC	NO		X	
4	Milieu-episodes	Z	NT	S	LL	NT	S LS	IC	NO		X	
Sydney and Nora										Yes	3/4	
1	Matched turns	M	AT	S TS	M	AT	S TS, LS	LC	HO			Yes
2	Target talk	L-H	AT	S TS	ML	NT	SV LS	NC	HO			
2	Expansions	Z	NT	S LS	LL	NT	S LS	IC	LO		X	
3	Time delays	Z	NT	S LS	LL	NT	S LS	IC	LO		X	
4	Milieu-episodes	Z	NT	S LS	LL	N	S LS	IC	NO		X	

Note. Regarding level L= low level, M= moderate level, H = high level, IL = increase in level, DL= decrease in level, NLC= no level change, Z= level at zero. Regarding trend, AT = accelerating trend, DT = decelerating trend, NT = no trend/ zero-accelerating trend. Regarding variability, SV = somewhat variable, HV= highly variable, S= Stable, Regarding Stability = LS = level stability, TS = trend stability. Regarding immediacy, IC = immediate change, LC= latent change = LC, NC = no change. Regarding overlap, LO= low overlap, MO= moderate overlap, HO= high overlap, NO= no overlap.

S1.7. Narrative Summary of Visual Analysis for Each Caregiver-Child Dyad

Percentage of Correct EMT Strategy Use

Jessica and Jameson

During the baseline condition, Jameson’s mother, Jessica showed stable responding, at a consistent level, for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. Her use of matched turns was moderate in level, with some variability (range = 14% – 46%). She had consistent low-level expansion use (range = 0 – 20%). Her time delay and milieu-teaching episode use was stable at zero throughout the baseline condition. In contrast, Jessica showed an immediate increase in level and a steep, accelerating therapeutic trend during the baseline condition for target talk. This increase in level occurred after EMT was implemented in Tier 1 for matched turns (session 7). She met the learning criterion for target talk prior to instruction on that EMT strategy. Even though Jessica met the learning criterion for target talk during the baseline condition, the interventionist formally introduced the strategy, provided performance feedback on strategy use, and continued data collection in order to observe potential changes in strategy use over time.

During the intervention condition, Jessica demonstrated an immediate increase in level for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, she showed an immediate, moderate increase in level with a gradual, accelerating trend. Her performance remained stable once she met the learning criterion (range = 71% – 94%). For expansions, Jessica exhibited a large, abrupt increase in level with a steep, accelerating (therapeutic) trend, which continued until she met the learning criterion. After she met the learning criterion, her expansion use remained at a high level with some variability (range = 50% – 100%). For time delays and milieu teaching episodes, Jessica showed a large, abrupt increase in level and a stable, zero-accelerating trend near the strategy ceiling (time delays range = 75% – 100%; milieu teaching episodes (range = 0 – 100%). For milieu teaching episodes, data point 28 represented an outlier because no milieu teaching episodes were attempted during that session. For target talk, Jessica did not show a clear change in level since her percentage of target talk overlapped with her performance during the baseline condition. Jessica met the

learning criterion for the four EMT strategies taught during the intervention condition. Jessica met the learning criterion for matched turns, expansions, time delays, and milieu teaching episodes. A functional relation was established between the EMT-TP and percentage of correct EMT strategies since Jessica’s behavior changed at four different points in time across all four tiers.

Elena and Ira

During the baseline sessions, Ira’s mother, Elena, had stable data for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, her percentage of strategy use was low, stable, and had a zero-accelerating trend (range = 21% – 26%). For expansions and milieu teaching episodes, Elena’s strategy use was stable at zero. For time delays, her strategy use was stable at zero aside from one outlier (data point 13). For target talk, she showed an immediate increase in level, high variability (range = 2%- 60%) and an accelerating trend after the intervention was applied in Tier 1 (session 6).

During the intervention sessions, Elena exhibited an immediate increase in level for four EMT strategies: matched turns, expansions, time delays and milieu teaching episodes. For matched turns, she demonstrated an abrupt increase in level with a gradual, accelerating trend (range = 58 % – 86%). In addition, her strategy use remained stable at a high level (> 80%) after she met the learning criterion (sessions 14 – 33). For expansions, Elena showed a large, abrupt increase in level, which maintained at moderate to high levels (range = 33% - 100%). She had one outlier (data point 33), which overlapped with her performance during the baseline condition. During this session, Ira did not use a spoken word or manual sign which Elena could expand. For time delays and milieu teaching episodes, Elena had large and abrupt increases in level which she maintained a high level throughout the intervention (range = 67% – 100%). She had one outlier for each strategy, data point 27 for time delays and data point 29 for milieu teaching episodes. For target talk, Elena did not show an immediate increase in level. Instead, she showed initial overlap with the baseline condition, followed by a moderate increase in level and a stable, zero-accelerating trend after she met the learning criterion (range = 55% – 75%). Elena met the learning criterion during the intervention condition for all five EMT strategies taught. A functional relation was

established between the EMT-TP and the percentage of correctly used EMT strategies because Elena’s behavior changed at four different points in time across all four tiers.

Terry and Ambyr

During the baseline sessions, Ambyr’s grandmother, Terry had stable responding for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, her strategy use was at a moderate level with a variable, decelerating (contra-therapeutic) trend (range = 15% – 41%). For expansions, her strategy use was low and at zero for the majority of baseline sessions but for three baseline sessions (data points 4 – 6), Terry’s expansion use was at a moderate level (range = 20% – 50%) before returning to zero. For time delays and milieu teaching episodes, Terry’s strategy use was low and stable at zero. For target talk, she showed an immediate increase in level and an accelerating (therapeutic) trend, after the intervention was applied in Tier 1 (session 6). Terry’s use of target talk was at a high level during the last five baseline sessions (range = 63% – 90%). She met the learning criterion for target talk during the baseline condition. Even though, she met the learning criterion, data collection continued in order to observe potential changes in strategy use over time.

During the intervention condition, Terry showed a large and abrupt increase to a moderate or high level for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, she showed a large, immediate increase in level (range = 68% – 92%) with stable responding throughout the intervention condition. For expansions, Terry demonstrated an immediate increase in level, with some variability (range = 0 – 100). She had two outlier data points (session 12, 13) that overlapped with her performance during baseline. For time delays, Terry showed an abrupt increase in level followed by a steep, accelerating trend which stabilized at or near the strategy ceiling (range = 86% – 100%). For milieu-teaching episodes, she showed an abrupt increase in level followed by performance at the strategy ceiling (100%) during all of the intervention sessions. In contrast, for target talk, Terry showed an immediate decrease in level (range = 51% – 62%) followed by a variable trend. The decrease in target talk use represented a positive change because ideal target talk involves 50% of adult utterances at the child’s target MLU and 50% of utterances above the child’s target MLU. Terry’s

target talk had a large amount of overlapping data between baseline and intervention conditions. She met the learning criterion for four EMT strategies taught during the intervention condition: matched turns, expansions, time delays, milieu-teaching episodes. A functional relation was established between the EMT-TP and the percentage of correctly used EMT strategies because Terry’s behavior changed at four different points in time across all four tiers.

Sydney and Nora

During the baseline condition, Nora’s mother Sydney had low to moderate stable for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns Sydney had moderate level stable responding (range = 42% – 54%). For expansions, time delays, and milieu episodes, Sydney had low, stable responses at zero. For target talk, Sydney had low level data but when the intervention was applied in Tier 1 (session 6), there was an immediate increase in level and accelerating trend. She met the learning criterion for target talk during the baseline session, but data collection continued to observe potential changes in strategy use over time.

During the intervention condition, Sydney demonstrated a large, immediate increase in level for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, she showed a large, immediate increase in level, followed by a gradual, accelerating (therapeutic) trend (range = 67% – 90%). This trend stabilized to zero-accelerating shortly after she met the learning criterion. For expansions, Sydney demonstrated an immediate increase in level followed by a variable, zero-accelerating trend (range = 0 – 100). She had two outlier data points (session 12, session 18) that overlapped with her performance during baseline. For time delays, Sydney showed an abrupt increase in level followed by a variable trend which stabilized at or near the strategy ceiling (range = 50% – 100%). For milieu-teaching episodes, she showed an abrupt increase in level followed by performance at the strategy ceiling for most intervention sessions. A functional relation was established between the EMT-TP and the percentage of correctly used EMT strategies because Sydney’s behavior changed at four different points in time across all four tiers.

Number of Correct EMT Strategies

Jessica and Jameson

During the baseline condition, Jessica had stable responses for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, Jessica’s strategy use was at a moderate level with some variability and a zero-accelerating trend (range = 22 – 50). For expansions, time-delays, and matched turns, her strategy use was stable at or near zero. For target talk, Jessica’s strategy use began at a moderate level (range = 6 – 19). However, after the intervention was applied in Tier 1 (session 7) she demonstrated an abrupt increase in level with a steep, accelerating (therapeutic) trend (range = 37 – 62).

During the intervention condition, Jessica demonstrated a clear and immediate increase in level for three EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, she showed a modest increase in level immediately after the intervention was applied, but these data points overlapped with some baseline data. A close examination of the trend revealed patterns of zero-acceleration (e.g., data points 7 – 12) and gradual acceleration (e.g., data points 12 – 14 and 21 – 29). For expansions, Jessica exhibited an abrupt increase in level with some variability (range = 3 – 29). Her performance also showed a gradual, accelerating (therapeutic) trend which plateaued to a zero-accelerating trend after data point 22 (range = 17- 29). For time delays and milieu teaching episodes, Jessica displayed an abrupt increase in level with some variability (time delays range = 1 – 8; matched turns range = 0 – 10). For target talk, she did not demonstrate an increase in level. The accelerating trend established during baseline plateaued to a variable, zero-accelerating trend. Although changes in level were small for expansions, time delays, and matched turns, they were consistent and occurred immediately following the introduction of the intervention. Additionally, they were within the expected frequency range recommended in prior research (1- 10 times during a 10 minute interaction for Time Delays and 1 – 5 times during a 10 minute interaction for milieu teaching episodes). A functional relation between the EMT-TP and increases in number of correct EMT strategies used by caregivers was established because Jessica’s behavior changed at 3 different points in time, across 3 consecutive tiers.

Elena and Ira

During the baseline condition, Elena exhibited stable responding for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, Elena’s strategy use was at a moderate level with a stable, zero-accelerating trend (range = 25 – 41). For time delays, expansions, and milieu teaching episodes her baseline performance was low and stable at or near zero. For target talk, Elena’s strategy use began at a moderate level with some variability (range = 5 – 11). After the interventionist delivered the intervention in Tier 1 (session 6) Elena showed an accelerating (therapeutic) trend for target talk.

During the intervention condition, Elena demonstrated an immediate increase in strategy use after the intervention was applied for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, she showed a modest increase in level and a gradual, accelerating (therapeutic) trend, which stabilized after she met the learning criterion (session 15). For expansions, time delays, and milieu-teaching episodes, Elena showed a small increase in level, with a stable zero-accelerating trend (expansions range = 1 – 13; time delays range = 0 – 7; milieu teaching episodes range = 0 – 6). For target talk, there was no clear increase in level. The accelerating trend, which began during the baseline sessions continued into the intervention condition. A functional relation between EMT-TP and increases in number of correct EMT strategies used by caregivers was established because Elena’s behavior changed at 4 different points in time, across 4 tiers.

Terry and Ambyr

During the baseline condition, Terry exhibited stable responding for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, Terry’s strategy use was stable at a moderate level with a zero-accelerating trend (range = 23 – 40). For time delays, expansions, and milieu teaching episodes her performance was low and stable at or near zero. For target talk, Terry’s strategy use began at a low level (range = 1– 9) and was stable. But after the interventionist delivered the intervention in Tier 1 (session 6), Terry showed an immediate increase in level and an accelerating (therapeutic) trend for target talk (range = 37 – 51).

During the intervention condition, Terry demonstrated an immediate increase in strategy use after the intervention was applied for four EMT strategies: matched turns, expansions, time delays, and milieu teaching episodes. For matched turns, she showed a modest increase in level and a gradual, accelerating (therapeutic) trend with some variability (range = 51 – 81). For expansions, time delays, and milieu-teaching episodes, Terry showed an abrupt increase in level and a stable, zero-accelerating trend (expansions range = 0 – 19; time delays range = 1 – 6; milieu-teaching episodes range = 2 – 4). For target talk, there was no clear increase in level. The accelerating trend, which began during the baseline sessions continued into the intervention condition (range = 36 – 67). We did not detect the presence of a functional relation due to the amount of overlap between the baseline and intervention conditions during the first three sessions in Tier 2 Target Talk and Expansions.

Sydney and Nora

During the baseline condition, Sydney had stable responses for three EMT strategies: expansions, time delays, and milieu teaching episodes. For matched turns and target talk, Sydney’s strategy use was at a moderate level with some variability and an increasing trend (matched turns range = 37 – 54 and target talk range = 16 – 74).

During the intervention condition, Sydney demonstrated a clear increase in level for three EMT strategies: expansions, time delays, and milieu teaching episodes. For matched turns, she showed a modest increase in level immediately after the intervention was applied but there is low confidence in a demonstration of effect due to the increasing trend seen in baseline which continued during the intervention. Her performance for target talk remained consistent with her performance during baseline sessions. For expansions, time delays, and milieu episodes there was a small but consistent increase in level and zero-accelerating trend. For expansions, Sydney exhibited an immediate increase in level with some variability and three instances of overlap with baseline. For time delays and milieu teaching episodes, Sydney showed an immediate increase in level with the intervention was applied, with consistent performance (range = 0 – 4 for time delays and 1 – 4 milieu teaching episodes. For target talk and matched turns, Sydney did not demonstrate an increase in level secondary to the accelerating trends

observed in baseline. However, Despite the fact that two tiers showed did not demonstrate an intervention effect for matched turns, and target talk, there were three clear demonstrations of effect for expansions, time delays, and milieu teaching episodes. A functional relation between the EMT-TP and increases in number of correct EMT strategies used by caregivers was established because Jessica’s behavior changed at 3 different points in time, across 3 consecutive tiers. We assessed a functional relationship, but with low confidence due the baseline trends for matched turns and target talk

SI.8. Non-overlap and Parametric Effect Size Metrics for Percentage of Correct EMT Strategies

Dyad	EMT Strategy	NAP	SE	95% CI	Non-overlap	LRRi	SE	95% CI	% Increase	Demonstration	Actual/ Potential	Functional Relation
Jessica and Jameson											4/4	YES
Tier 1	Matched turns	0.99*	0.01	[0.78 – 1.00]	Large	1.09*	0.21	[0.69 – 1.50]	199%	X		
Tier 2	Target talk/ Expansions	0.89* 1.00*	0.06 0.00	[0.70 – 0.96] [1.00 – 1.00]	Small Large	0.79* 3.11*	0.24 0.65	[0.33 – 1.25] [1.84 – 4.38]	120% 2141%	X X		
Tier 3	Time delays	1.00*	0.00	[1.00 – 1.00]	Large	--	--	--	--	X		
Tier 4	Milieu episodes	0.92	0.09	[0.67 – 0.98]	Small	--	--	--	--	X		
Elena and Ira											4/4	YES
Tier 1	Matched turns	1.00*	0.00	[1.00 – 1.00]	Large	1.24*	0.05	[1.14 – 1.34]	246%	X		
Tier 2	Target talk/ Expansions	0.93* 0.97*	0.04 0.03	[0.77 – 0.98] [0.83 – 1.00]	Medium Large	1.19* --	0.28 --	[0.64 – 1.74] --	229% --	X X		
Tier 3	Time delays	0.93*	0.05	[0.75 – 0.98]	Medium	2.40*	1.00	[0.43 – 4.37]	999%	X		
Tier 4	Milieu episodes	0.93*	0.07	[0.71 – 0.98]	Medium	--	--	--	--	X		
Terry and Ambyr											4/4	YES
Tier 1	Matched turns	1.00*	0.00	[1.00 – 1.00]	Large	0.96*	0.16	[0.65 – 1.27]	160%	X		
Tier 2	Target talk/ Expansions	0.55* 0.92*	0.15 0.05	[0.34 – 0.74] [0.73 – 0.98]	Small Small	0.34 1.51*	0.31 0.56	[-0.26 – 0.94] [0.41 – 2.61]	41% 352%	X X		
Tier 3	Time delays	1.00*	0.00	[1.00 – 1.00]	Large	--	--	--	--	X		
Tier 4	Milieu episodes	1.00*	0.00	[1.00 – 1.00]	Large	--	--	--	--	X		
Sydney and Nora											4/4	YES
Tier 1	Matched turns	1.00*	0.00	[1.00 – 1.00]	Large	0.57*	0.05	[0.47 – 0.67]	77%	X		
Tier 2	Target talk/ Expansions	0.58* 0.95*	0.15 0.04	[0.36 – 0.76] [0.76 – 0.99]	Small Medium	0.31 --	0.22 --	[-0.13 – 0.74] --	36% --	X X		
Tier 3	Time delays	0.96*	0.04	[0.79 – 0.99]	Large	--	--	--	--	X		
Tier 4	Milieu episodes	1.00*	0.00	[1.00 – 1.00]	Large	--	--	--	--	X		

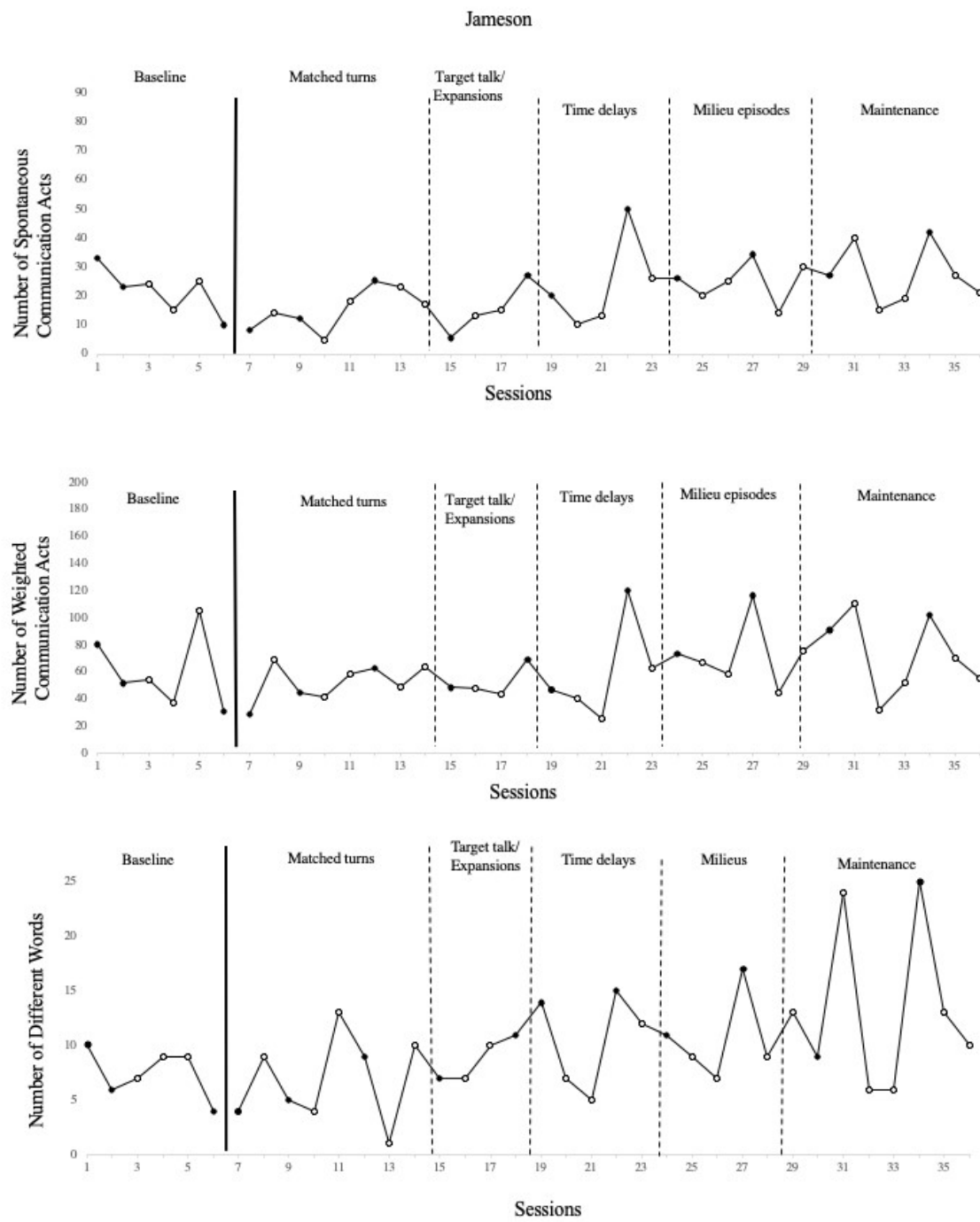
Note. * = Significant estimate, as 95% confidence interval does not include zero. CI = Confidence interval, NAP = non-overlap of all pairs (Parker & Vannest, 2009) SE = standard error. Criteria for NAP estimates for no effect, small effect, and large effect were based on Peterson-Brown et al. (2012). No effect = < 0.50, Small = 0.51 – 0.92, Medium = 0.93 – 0.96, Large = > 0.96

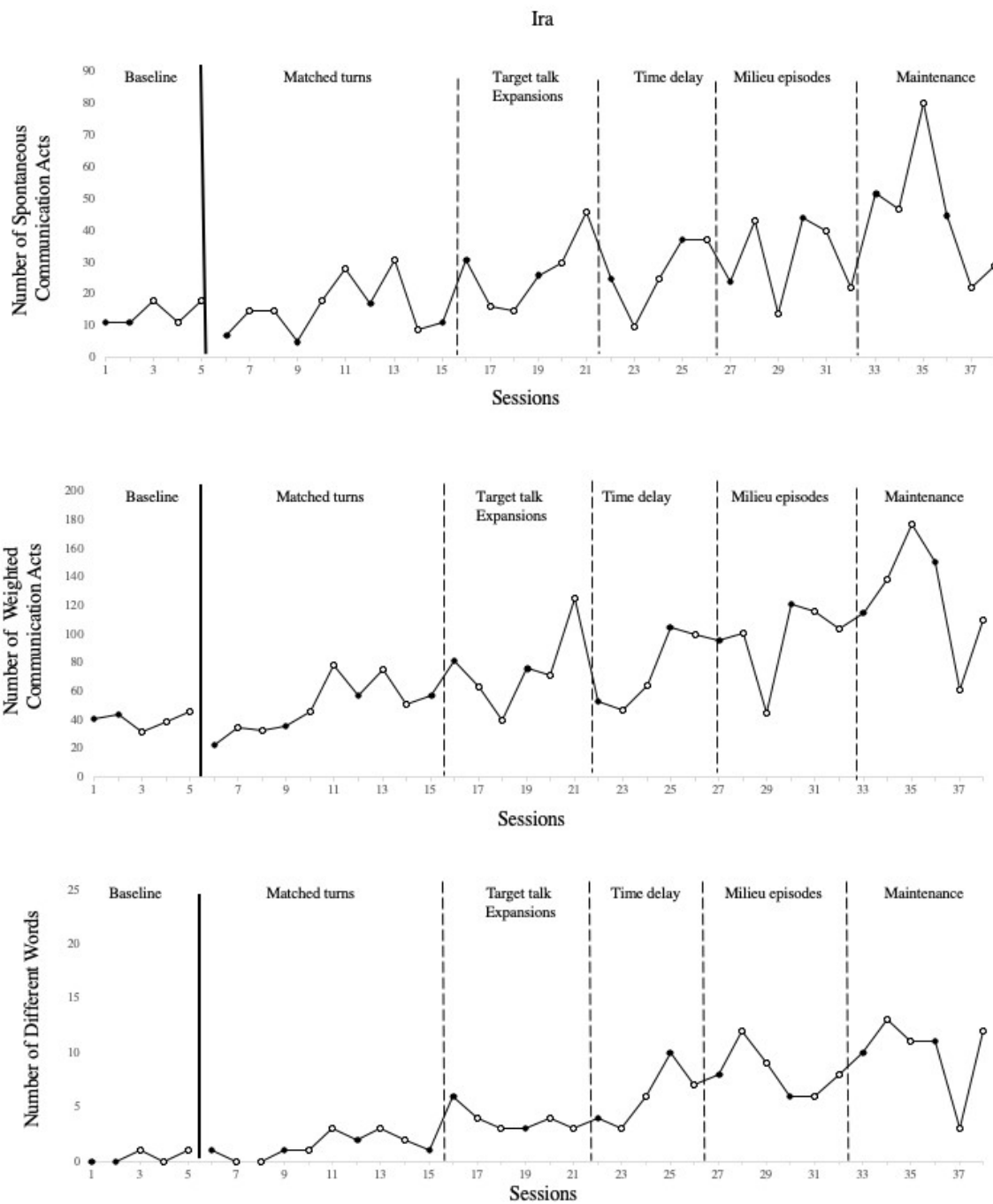
SI.9. Non-overlap indices and Parametric Effect Sizes for Number of Correct EMT Strategies

Dyad	EMT Strategy	NAP	SE	95% CI	Non-overlap	LRRi	SE	95% CI	% Increase	Demonstration	Actual/ Potential	Functional Relation
Jessica and Jameson											3/4	Yes
Tier 1	Matched turns	0.85*	0.10	[0.59 – 0.95]	Small	0.47*	0.16	[0.15 – 0.79]	60%			
Tier 2	Target talk/ Expansions	0.82* 1.00*	0.08 0.00	[0.61 – 0.92] [1.00 – 1.00]	Small Large	0.64* 3.61*	0.21 0.59	[0.23 – 1.04] [2.45 – 4.77]	89% 3590%	X		
Tier 3	Time delays	1.00*	0.00	[1.00 – 1.00]	Large	5.00*	0.14	[4.72 – 5.28]	14775%	X		
Tier 4	Milieu episodes	1.00*	0.00	[1.00 – 1.00]	Large	5.14*	0.46	[4.24 – 6.03]	16914%	X		
Elena and Ira												
Tier 1	Matched turns	1.00*	0.00	[1.00 – 1.00]	Large	0.65*	0.09	[0.49 – 0.82]	92%	X	4/4	Yes
Tier 2	Target talk/ Expansions	0.91* 0.97*	0.06 0.08	[0.74 – 0.97] [0.83 – 1.00]	Small Large	1.13* 5.00*	0.28 0.15	[0.57 – 1.68] [4.70 – 5.30]	208% 14737%	X		
Tier 3	Time delays	0.91*	0.06	[0.73 – 0.97]	Small	3.92*	1.01	[1.94 – 5.91]	4949%	X		
Tier 4	Milieu episodes	0.93*	0.07	[0.71 – 0.98]	Medium	5.29*	0.22	[4.86 – 5.71]	19676%	X		
Terry and Ambyr											3/4	No
Tier 1	Matched turns	1.00*	0.00	[1.00 – 1.00]	Large	0.70*	0.10	[0.50 – 0.91]	102%	X		
Tier 2	Target talk/ Expansions	0.82* 0.92*	0.08 0.05	[0.60 – 0.92] [0.73 – 0.98]	Small Small	0.65* 2.37*	0.28 0.58	[0.10 – 1.20] [1.23 – 3.51]	91% 969%			
Tier 3	Time delays	1.00*	0.00	[1.00 – 1.00]	Large	4.90*	0.11	[4.68 – 5.12]	13276%	X		
Tier 4	Milieu episodes	1.00*	0.00	[1.00 – 1.00]	Large	4.90*	0.13	[4.66 – 5.15]	13337%	X		
Sydney and Nora											3/4	Yes
Tier 1	Matched turns	0.88*	0.07	[0.60 – 0.97]	Small	0.31*	0.08	[0.15 – 0.47]	36%			
Tier 2	Target talk/ Expansions	0.72* 0.95*	0.11 0.04	[0.50 – 0.87] [0.76 – 0.99]	Small Medium	0.35 4.03*	0.21 0.15	[-0.06 – 0.75] [3.74 – 4.32]	41% 5541%	X		
Tier 3	Time delays	0.96*	0.04	[0.79 – 0.99]	Large	4.18*	0.19	[3.81 – 4.54]	6414%	X		
Tier 4	Milieu episodes	1.00	0.00	[1.00 – 1.00]	Large	4.67*	0.17	[4.34 – 5.00]	10551%	X		

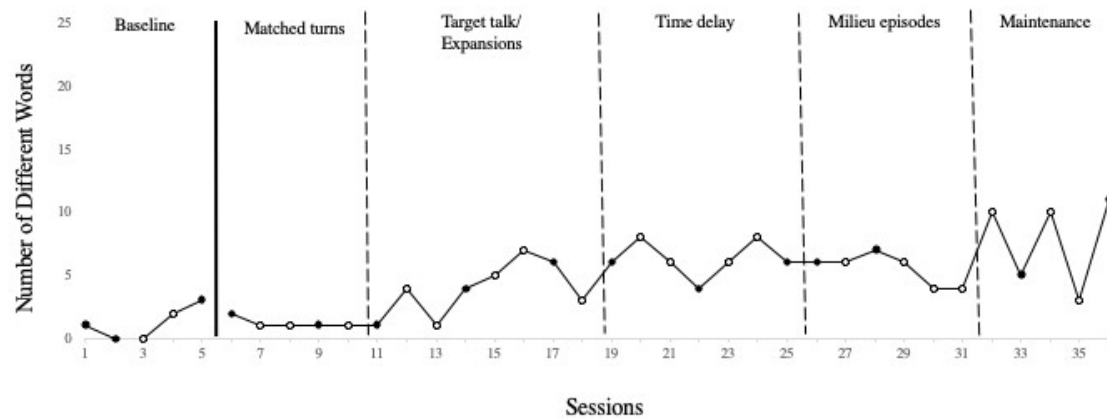
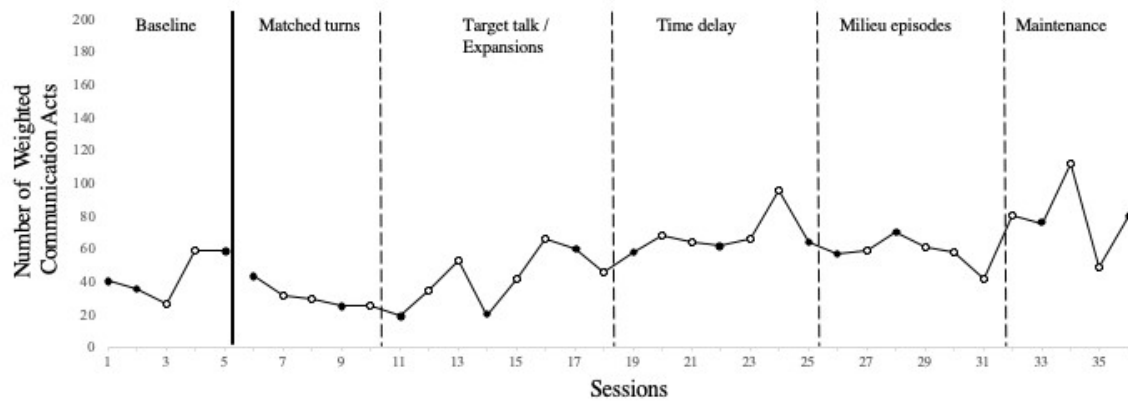
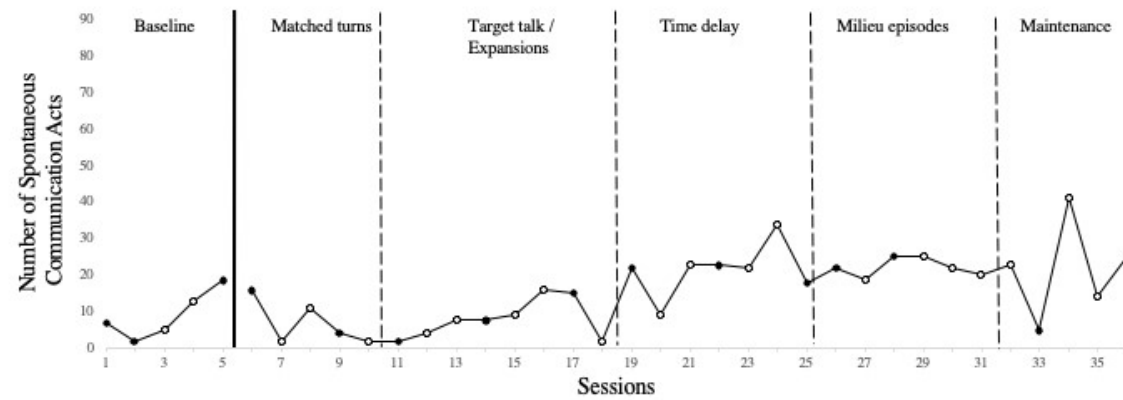
Note. * = Significant estimate, as 95% confidence interval does not include zero. CI = Confidence interval, NAP = non-overlap of all pairs (Parker & Vannest, 2009) SE = standard error. Criteria for NAP estimates for no effect, small effect, and large effect were based on Peterson-Brown et al. (2012). No effect = < 0.50, Small = 0.51 – 0.92, Medium = 0.93 – 0.96, Large = > 0.96

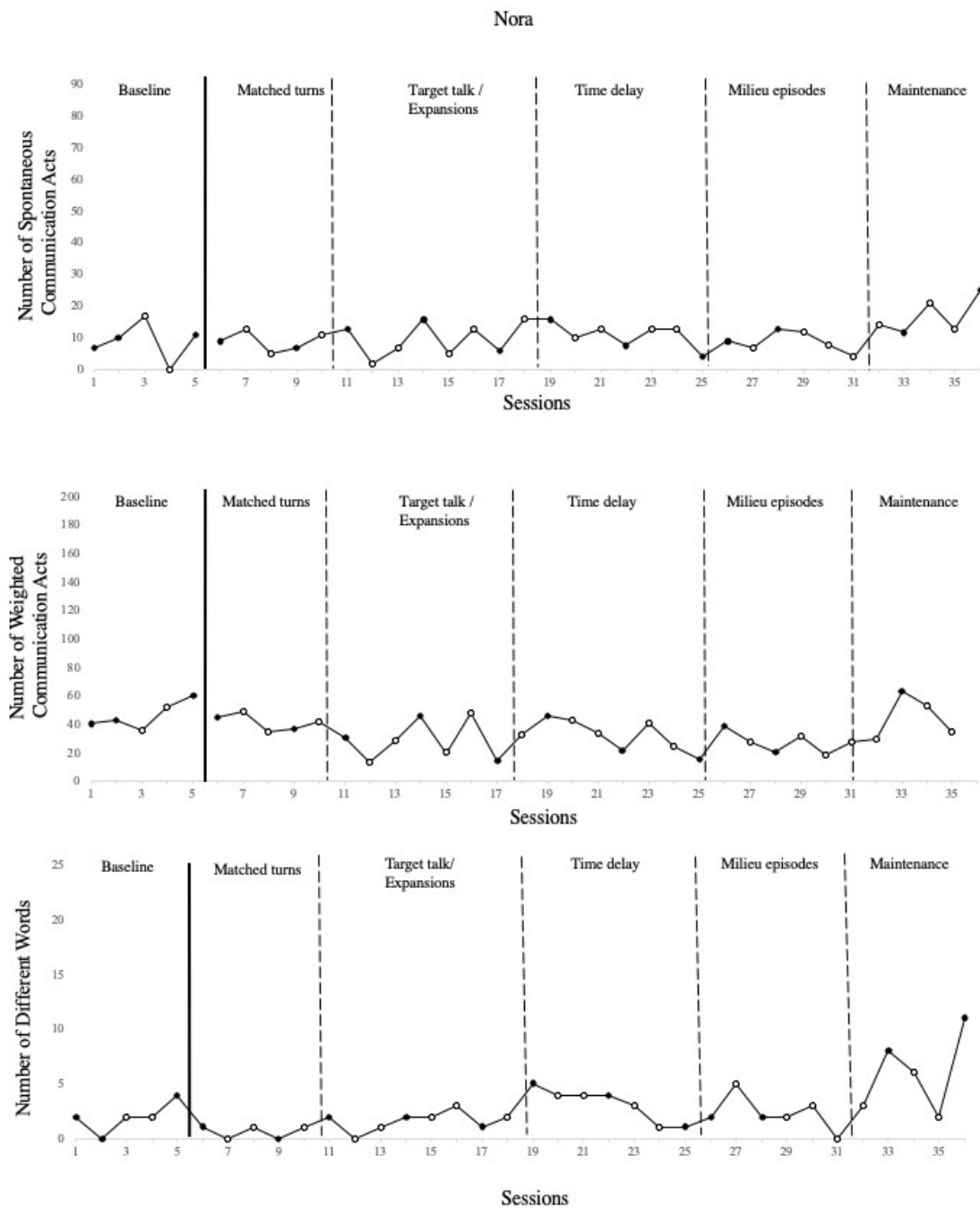
S1.10. Child Communication Outcomes





Ambyr





S11. Caregiver Assessment of Social Validity

Intervention Goals	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Average
The language and communication goals addressed during sessions make sense for my child.					4/4 100%	5.00
The language and communication goals addressed during sessions are important for my child’s development and meaningful to me and my family.					4/4 100%	5.00
Intervention Procedures						
My coach’s suggestions are easy to follow.				2/4 50%	2/4 50%	4.50
I am able to use program strategies during typical activities and routines.				2/4 50%	3/4 50%	4.50
The duration of our sessions is acceptable for my family.				2/4 50%	2/4 50%	4.50
Intervention Effects						
The sessions are effective in helping me learn language support strategies to help my child					4/4 100%	5.00
The sessions are effective in improving my child’s language and communication skills.					4/4 100%	5.00
I would recommend this program to other parents of children with language delays.					4/4 100%	5.00

SI.12. Assessment Materials and Telepractice Equipment Expenses

Budget Expenses	EMT Telepractice Program	EMT (in-person)
Assessment Materials		
PLS-5	\$ 395.00	\$ 395.00
MSEL	\$ 956.00	\$ 956.00
MCDI	\$ 26.00	\$ 26.00
CBCL	\$ 160.00	\$ 160.00
Language Sample Toy Materials	\$ 300.00	\$ 300.00
SPA toy materials	\$ 300.00	\$ 300.00
Assessment Materials Subtotal	\$ 2137.00	\$ 2137.00
Telepractice Equipment and Software		
3 iPads	\$ 987.00	NA
3 Kubi	\$ 1800.00	NA
1 Professional Zoom Account Subscription	\$ 120.00	NA
1 Blue tooth headset	\$ 32.00	NA
Telepractice Materials Subtotal	\$ 2939.00	\$ 0.00
Materials Total	\$5076.00	\$2137.00

SI.13 Intervention Costs Per Caregiver Child Dyad

Caregiver-Child Dyad	Jessica and Jameson		Elena and Ira		Terry and Ambyr		Sydney and Nora		All Participants	
Budget Expenses	EMT-TP	EMT	EMT-TP	EMT	EMT-TP	EMT	EMT-TP	EMT	EMT-TP	EMT
Eligibility assessment										
Personnel clinical services	\$72.00	\$72.00	\$72.00	\$72.00	\$72.00	\$72.00	\$72.00	\$72.00	\$288.00	\$288.00
Personnel driving time	\$129.60	\$129.60	\$93.60	\$93.60	\$262.80	\$262.80	\$180.00	\$180.00	\$666.00	\$666.00
Mileage	\$67.84	\$67.84	\$24.96	\$24.96	\$188.68	\$188.68	\$144.16	\$144.16	\$425.64	\$425.64
Assessment Materials	\$534.25	\$534.25	\$534.25	\$534.25	\$534.25	\$534.25	\$534.25	\$534.25	\$2137.00	\$2137.00
Assessment subtotal	\$803.69	\$803.69	\$724.81	\$724.81	\$1057.73	\$1057.73	\$930.41	\$930.41	\$3516.64	\$3516.64
Intervention Sessions										
Personnel clinical services	\$1296.00	\$1296.00	\$1368.00	\$1368.00	\$1296.00	\$1296.00	\$1260.00	\$1260.00	\$5220.00	\$5220.00
Personnel driving time	\$842.40	\$2333.80	\$655.20	\$1778.40	\$1981.80	\$4665.60	\$1350.00	\$3150.00	\$4829.40	\$11927.80
Mileage	\$432.64	\$1221.12	\$174.72	\$483.36	\$1415.10	\$3396.24	\$1081.20	\$2522.80	\$3103.66	\$7623.52
Telepractice equipment and materials	\$734.75	\$0.00	\$734.75	\$0.00	\$734.75	\$0.00	\$734.75	\$0.00	\$2939.00	\$0.00
Intervention subtotal	\$3305.79	\$4850.92	\$2932.67	\$3629.76	\$5427.65	\$9357.84	\$4425.95	\$6932.80	\$16092.06	\$24771.32
Post intervention assessment										
Personnel clinical services	\$54.00	\$54.00	\$54.00	\$54.00	\$54.00	\$54.00	\$54.00	\$54.00	\$216.00	\$216.00
Personnel driving time	\$129.60	\$129.60	\$93.60	\$93.60	\$262.80	\$262.80	\$180.00	\$180.00	\$666.00	\$666.00
Mileage	\$67.84	\$67.84	\$24.96	\$24.96	\$188.68	\$188.68	\$1623.125	\$144.16	\$1904.605	\$425.64
Post-intervention subtotal	\$251.44	\$251.44	\$172.56	\$172.56	\$505.48	\$505.48	\$1857.125	\$378.16	\$2786.605	\$1307.64
Combined Total	\$4360.92	\$5906.05	\$3830.04	\$4527.13	\$6990.86	\$10921.05	\$7213.49	\$8241.37	\$22395.31	\$29595.60

