Supplemental Information

INTERVENTION DESCRIPTION

Tau

TAU was defined as what the child was currently receiving as speech-language therapy at the time of the study. As a general summary of a therapy session, the SLP targets skills to improve language and communication function (no AAC technology is used) by targeting deficits in prelanguage communication, vocal turn-taking, listening and attention, receptive language, sentence structure, grammatical morphemes, social functioning, and articulation. The speech and language goals vary by child and can include development of awareness and discrimination of sounds and phonemes, segmentation of words, and understanding of words, phrases, and sentences in context (routines). This occurs through modeling and pausing to provide opportunities for the child to imitate, encouraging repetition and practice of target language concepts. It also consists of the purposeful arrangement of opportunities for the child to initiate, request, and build communicative functions. Goals for each child are based on caregiver priorities (eg, plurals, increasing length of utterance, and use of tenses) and current communication skills. The child's individual goals are targeted across sessions, with caregivers engaged throughout to encourage home carryover. Sessions last ~1 hour, during which time the family and SLP identify opportunities to target language skills at home.

Typically, at our institution, weekly sessions over 12 weeks of SLP-guided therapy are prescribed and continue after a 12-week goal assessment.

Tali

The TALI follows the same general therapeutic model as described for TAU. As with TAU, the SLP targets necessary skills for language and communication function, but it differs by leveraging AAC software as a tool to help children develop effective language and communication skills. For the purpose of this research, we incorporated evidence-based AAC treatment strategies[52] using the TouchChat HD - AAC with WordPower language program (by Silver Kite),[53] which is a full-featured language system with multiple vocabulary files and a QWERTY keyboard with word prediction. The software company played no role in the study question, design, conduct, or analysis. The software is dynamic in nature (grows in complexity with child) and provides visual support for abstract linguistic concepts. It also offers voice output for each selection, serving as a consistent model for verbalizations and giving the child an additional mode of feedback for learning and self-monitoring. An individualized goal plan is created, and the same standard technology and software application is used to support each participant in reaching his or her goals. Language level (page set) in the software for each participant is determined by assessment of current language skills (occurring at baseline visit) and

identification of goals, allowing the child to access as many vocabulary words and linguistic functions as needed. During the intervention, the iPad was locked; the software was the only accessible application. Session timings followed an AAC clinical model. During the first TALI session (week 1), the AAC iPad is introduced to the child and family, and the SLP demonstrates and provides education for basic functions and features of the AAC application. During each session, TouchChat WordPower is used as a visual and audio teaching tool to target the child's individualized goals, and the SLP supports the child in constructing longer and more complex messages on the iPad. The child is always encouraged to use his or her voice to verbalize the same message, using the message constructed in the application as a verbal model. The child is also supported to be more active in self-monitoring and revising his or her own messages when errors occur (eg, repairing mistakes, adding missing words, adding word endings). Visual supports in TouchChat are used to target more complex linguistic concepts, and the child is encouraged to explore and practice new vocabulary words. Caregivers are engaged throughout and are taught how to similarly target language skills at home to encourage familiarity and carryover. Communication partners (eg, families and friends) use the device as a shared learning experience, allowing them to model language and learn and explore options, increasing competency levels

SUPPLEMETAL TABLE 4 Timing and Content of Each Intervention as Currently Conducted

	TALI Program	TAU Standard Therapy
Duration	24 wk	24 wk
Initial SLP visit, description of intervention with families, determination of baseline goals, and initial language evaluation	One-time visit, 1.5 h	One-time visit, 1.5 h
Discuss initial child-focused goals for therapy, set initial communication priorities	Week 1, 1–1.5 h	Week 1, 1–1.5 h
	Update as needed	Update as needed
Parent and child training	Weekly, weeks 1–6 & 13–18	Weekly sessions
Select appropriate language AAC page set	Monitored each week, weeks 1–6 & 13–18	AAC technology not used
Identify opportunities to incorporate high-tech AAC device at home	Discussed each week, weeks 1–6 & 13–18	AAC technology not used
Establish at-home goals and objectives	Weeks 6 & 18	Week 1, monitored throughout
Weekly at-home therapy only (no SLP-guided sessions)	Weeks 7–12 & 19–24	Weekly therapy, no at-home cycles
Continue with at-home therapy[a]	Throughout the day	Throughout the day
Assess AAC usage and goals for at-home cycle	Weeks 6 & 13	Weekly therapy, no at-home cycles
Collect language samples	Initial evaluation, weeks 6, 13, 18, and 24	Initial evaluation, Weeks 6, 13, 18, and 24
Final language evaluation	Week 24	Week 24
Who directs treatment[a]	SLP and child (weeks 1–6 and 13–18) Child and family (weeks 7–12 and 19–24)	SLP and child (family carryover into home) (all sessions)

[a] Both interventions have aspects that carry over into the natural environment with family (ie, at home).

of users.[66] Sessions last ~1 hour, during which time the family and SLP work to identify opportunities to integrate the device into daily routines and target skills at home. After the first 6-week cycle of therapy with the SLP (weeks 1–6), families continue with self-guided therapy at home (weeks 7–12). They return for a second intervention cycle (weeks 13–18) with the SLP, during which technology use and progress toward personal goals are reassessed. Children and their families complete the self-guided intervention at home (weeks 19–24).

Both programs are specifically designed for DHH children and contain similar curricular approaches for language intervention.

SUPPLEMENTAL TABLE 5 Means, With 95% Confidence Intervals, of Primary Outcomes for Children in the TALI and TAU Groups

Outcomes	TALI		TAU	
	Baseline	Post (24 wk)	Baseline	Post (24 wk)
MLU_m, mean (95% CI)	4.23 (4.22–4.24)	6.06 (5.57–6.55)	4.23 (4.21–4.24)	4.49 (3.93–5.06)
MTL, mean (95% CI)	4.91 (4.71–5.11)	7.26 (6.31–8.21)	4.90 (4.68–5.12)	5.42 (4.69–6.15)
NDW, mean (95% CI)	81.7 (80.9–82.4)	103.6 (96.3–110.8)	81.8 (81.1–82.5)	87.2 (77.9–96.6)
CELF receptive score, mean (SD)	80.0 (15.2)	90.6 (15.7)	82.1 (14.5)	83.6 (15.7)
CELF expressive score, mean (SD)	77.6 (16.0)	86.1 (15.8)	77.5 (19.6)	79.9 (18.5)

Means derived from LS means from repeated-measures models. CI, confidence interval.