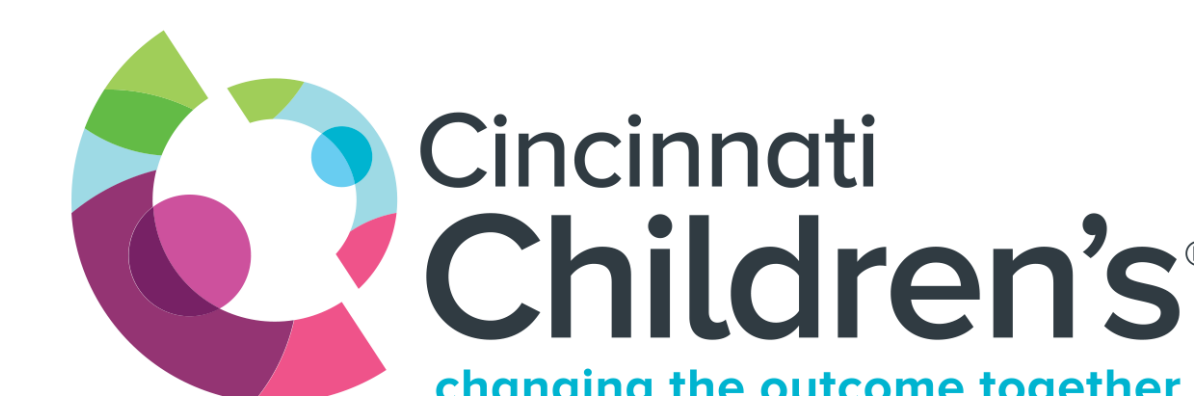


The Impact of Technology Assisted Language Intervention in school-aged children with Trisomy 21

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Language Development in Children with T21

- ❖ Children with Trisomy 21 (T21) have varied and persistent language difficulties in spite of early and prolonged access to speech-language pathology (SLP) services
- ❖ Many need supports for speech production, expanding speech utterances, and asking questions
- ❖ In addition, children can struggle processing verbal information and make slower progress in areas of syntax (formation of phrases and sentences)
- ❖ Many children with T21 are supported by augmentative and alternative communication (AAC) approaches to support expressive communication

Critical Gaps in Care

- ❖ **AAC is under-leveraged:** Still framed as a speech device, despite its role in language development
- ❖ **Support drops after early childhood:** AAC-informed strategies are not consistently continued or studied in older children with T21
- ❖ **Major intervention gap:** Few language interventions exist designed for school-aged children with T21

Technology-Assisted Language Intervention (TALI)

- ❖ New approach of incorporating AAC into SLP therapy as **language learning tool** (vs. speech generating)
- ❖ Leverages AAC technology to teach, model, prompt, recast, and provide feedback for language development
- ❖ Shown to improve spoken expressive and receptive language in children who are deaf/hard of hearing
- ❖ Leverages known learning strengths in T21: AAC provides visual, supported input aligned with language profiles
- ❖ Conducting a pilot study to test the feasibility of the TALI for children and adolescents with TS

Study Objective

- ❖ Understand the impact of TALI on spoken expressive and receptive language growth among school-aged children and adolescents with T21.

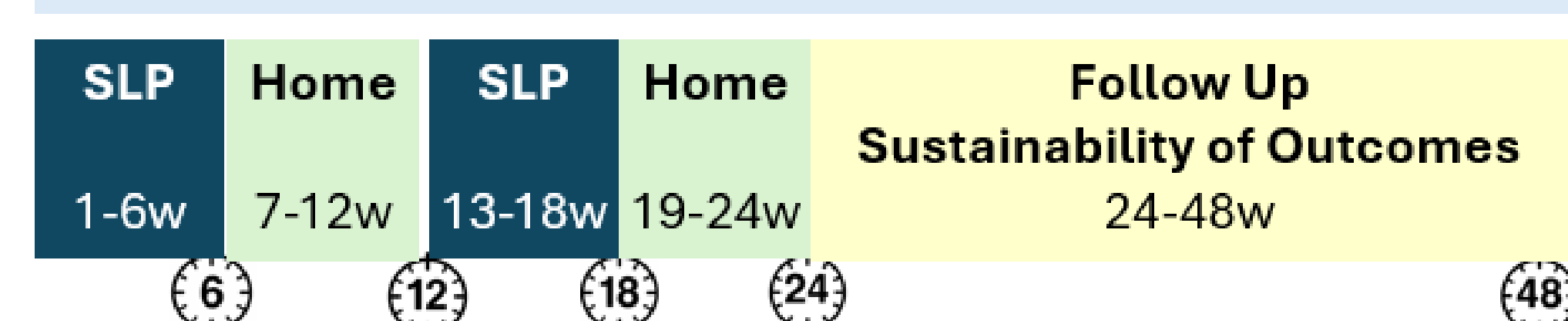
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Methods and Therapy Approach

- ❖ Ongoing enrollment of children with T21 ages 5-12 years
- ❖ Twenty-four week intervention of four 6-week cycles alternating across clinician-guided sessions with home-based practice (Fig1).

Figure 1. TALI Cycles and Evaluation Timing



Indicates timing of language samples. Assessments occur at baseline, week 12, and week 24

- ❖ Blinded ratings of spontaneous language samples collected at baseline, and 6-week intervals
 - ❖ **Syntax measured** - Mean length of utterance in morphemes (MLU)
 - ❖ **Semantics measured** - number of different words spoken (NDW)
- ❖ **Standardized language assessments** included the Preschool Language Scale-5 or the Oral and Written Language Scales 2nd Edition at baseline, 24, and 48 weeks
- ❖ Parent reported functional outcomes with the Vineland Adaptive Behavior Scale

Participants

- ❖ 10 children enrolled to date; 3 still completing follow up
- ❖ Children with completed visits similar to entire sample
- ❖ Children's language age equivalents were significantly lower than expected based on adaptive functioning

Characteristics	n=10
Median age at study in years (range)	7.9 (5.0-12.1)
Gender at birth, Female	50%
Race (all non-Hispanic) -	
Black/African American	10%
White	90%
Communication modalities used	
Spoken English	100%
ASL/sign language	40%
Gestures	60%
Household income >\$80,000	80%
Receives supplemental state insurance	20%
Receives speech therapy	100%
Vineland Adaptive Behavior Composite Score – mean	74 (4.3)
Baseline language age equivalents in mo*	Mean (SD) [range]
Receptive language age**	54.5 (17) [36-77]
Expressive language age**	47.7 (22) [27-91]

*including only those with completed follow-up;

**similar to standard scores, but overcomes floor effects

Results – Expressive Language

- ❖ 33% increase on average in **spoken language utterances** in morphemes in first 12 weeks, suggesting increased syntax complexity (Fig2)
- ❖ Significant increase in **number of different words spoken**, highlighting increased spoken vocabulary (Fig3)
- ❖ Average **expressive language age** increased by nearly 6 months in 6 months (24 weeks) (Fig 4)

Figure 2. Increases in Spoken Language Utterances in First 12 Weeks

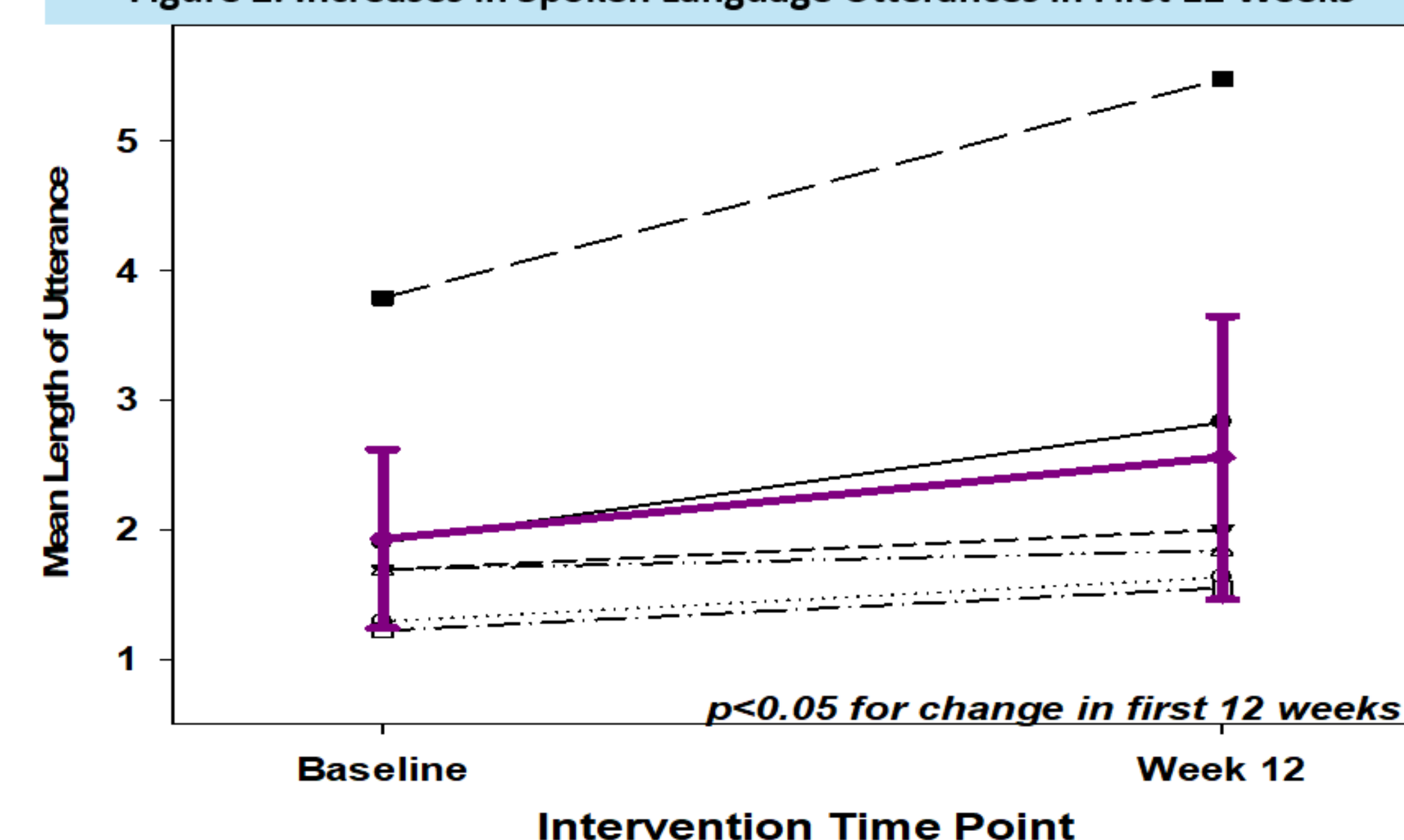


Figure 3. Increase in Number of Different Words Spoken in 12wks

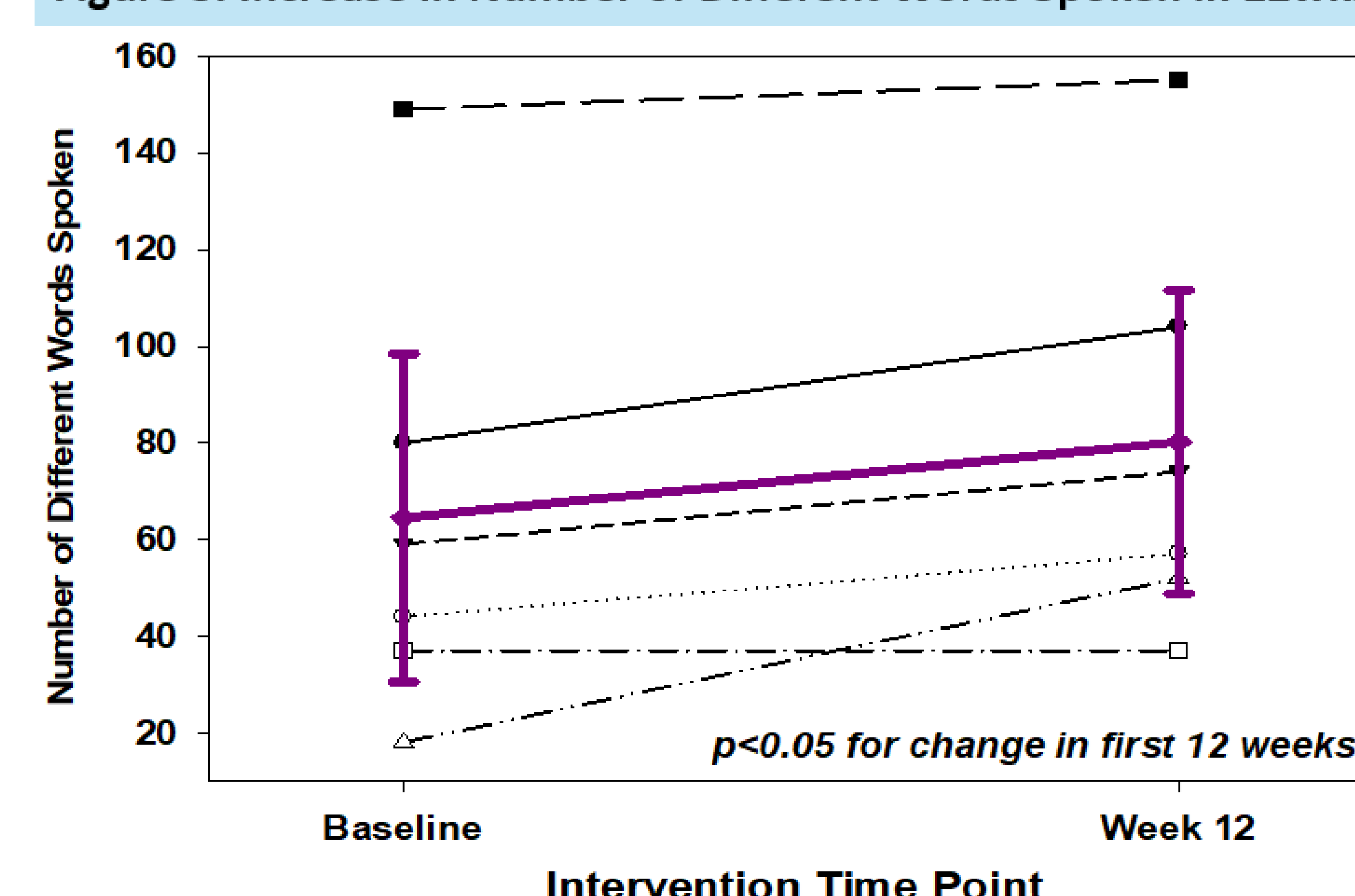
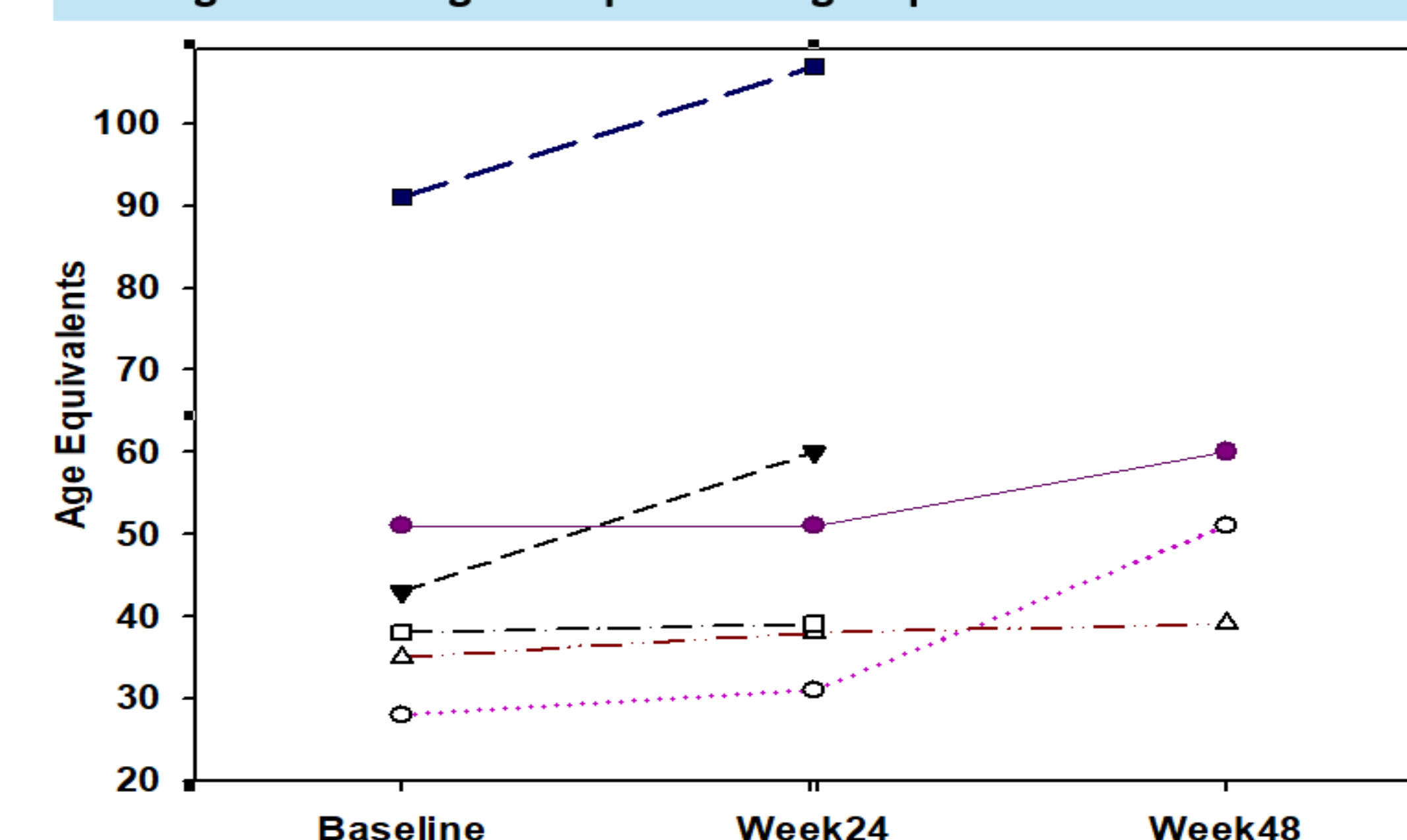


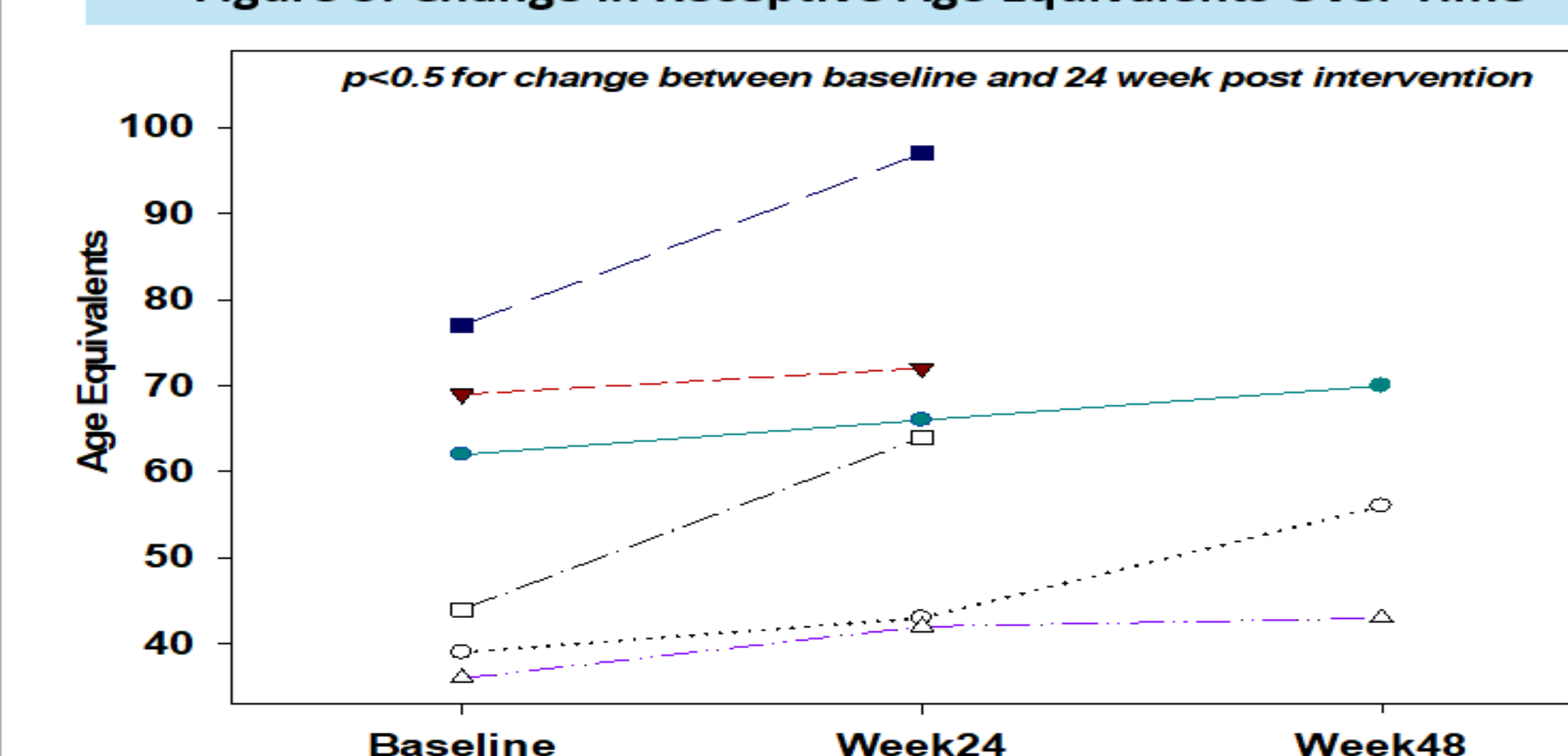
Figure 4. Change in Expressive Age Equivalents Over Time



Results – Receptive Language

- ❖ **Receptive language age** increased more than expected; half of children gained 6+ months language growth in 6 months (Fig 5)
- ❖ Two children made substantial growth in receptive language (20 months growth)

Figure 5. Change in Receptive Age Equivalents Over Time



Summary of Findings

- ❖ **Meaningful spoken language gains:** improvements seen in both receptive and expressive language
- ❖ **Increased linguistic complexity:** children produced more complex sentences in language samples
- ❖ **Faster than expected growth:** gains exceeded typical trajectories for children with T21
- ❖ **Feasible and valued by families:** high acceptability for home use, with families requesting continued sessions

Take Away Message

- ❖ **We may underestimate language potential in T21:** Children demonstrated greater-than-expected growth
- ❖ **AAC can drive language, not just speech output:** Technology-supported AAC shows promise for supporting continued spoken and receptive language development in school-aged children
- ❖ Ready for scale and testing: a large randomized trial is needed to evaluate effectiveness and support broader implementation of TALI