



Language Outcomes of Children who are Deaf or Hard of Hearing in OPTION Programs

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Project Aim

Characterize language development trajectories of children who are deaf or hard of hearing, are learning to develop listening and spoken language, and have attended OPTION programs between the ages of 3-5 years.

Background

- Children who are deaf or hard of hearing (DHH) can develop listening and spoken language when they receive early diagnosis, early access to sound through hearing technology, and early intervention.
- OPTION programs are a consortium of schools and intervention programs that provide listening and spoken language (LSL) intervention to infants, toddlers and children who are DHH.
- OPTION programs in the US, assess vocabulary and language proficiency annually, and enter outcomes data into the Listening and Spoken Language Data Repository (LSL-DR).
- Outcomes for children on whom three data points for standardized vocabulary and/or language assessments at age three, four, and five years were available, were analyzed.

Participant Demographics

Vocabulary scores at age three, four, and five years, on the **PPVT & EVT** or **ROWPVT & EOWPVT** were available for 404 children.

Language scores on **CELF-P** or **OWLS** were available on 125 of these children.

Gender - Female (49%), Male (51%)

Hearing Technology - Bilateral cochlear implants (36%), Bilateral hearing aids (27%), Bimodal - HA, CI (29%), BAHD/Softband (8%)

Age at Intervention in OPTION program - at or before 18 months (42%), 19-36 months (47%), after 36 months (11%).

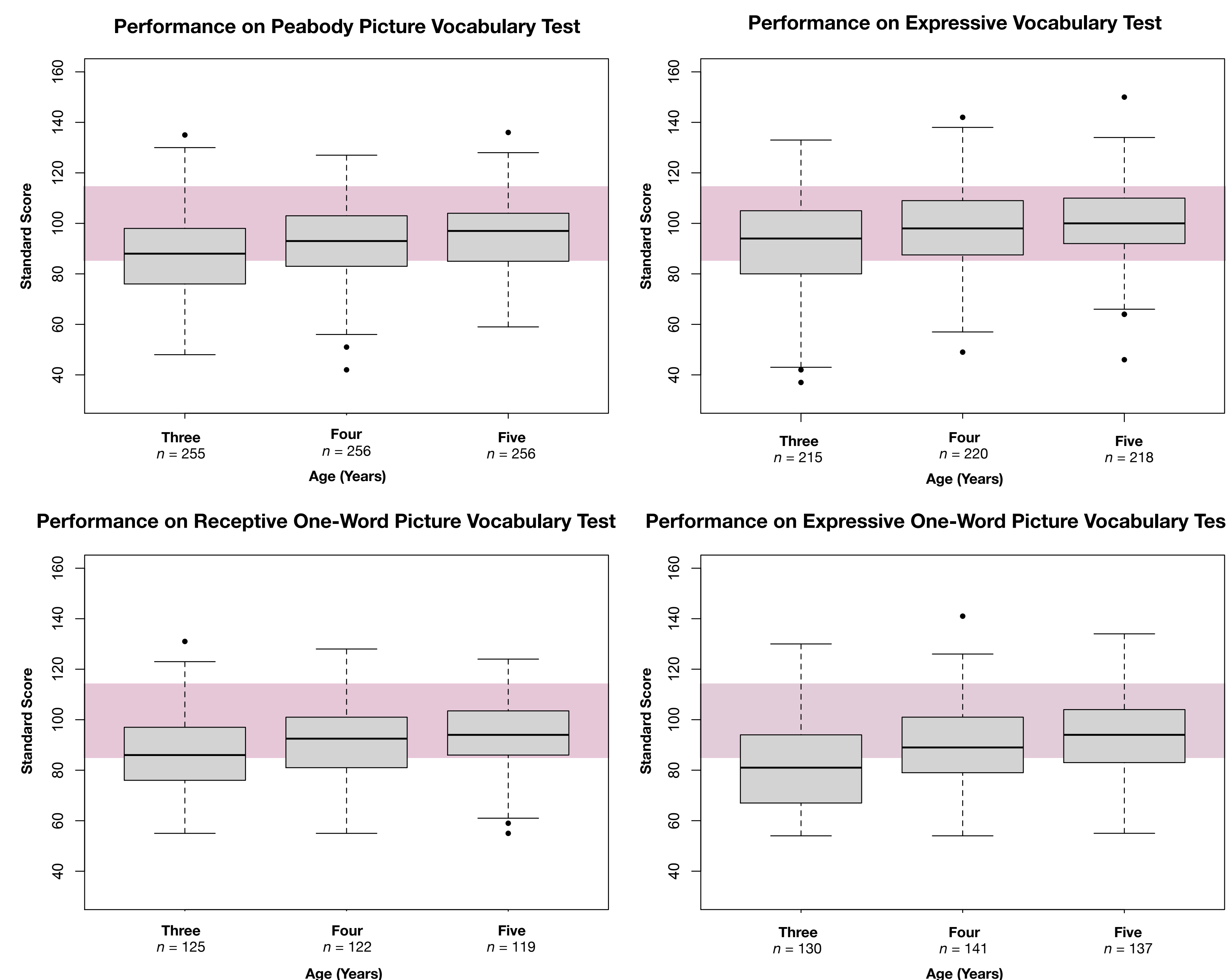
Approximately 20% of children demonstrated **additional impacting factors**.

PPVT = Peabody Picture Vocabulary Test, EVT = Expressive Vocabulary Test, ROWPVT = Receptive One-Word Picture Vocabulary Test, EOWPVT = Expressive One-Word Picture Vocabulary Test, CELF-P = Clinical Evaluation of Language Fundamentals - Preschool, OWLS = Oral Written Language Scales

Results

Vocabulary Growth Over Age 3 to 5 years

A review of performance on receptive and expressive vocabulary assessments indicates a positive trend of growth in this domain from age three to five years, with more than 75% of the sample demonstrating scores within the average range by age five years.



The boxplots above characterize vocabulary proficiency of children who are DHH. The upper and lower edges of the boxplots refer to approximately the 75th and 25th percentile of this sample, respectively. The thick line in the box refers to median or 50th percentile. The light pink shaded area indicates the average range, i.e., standard score between 85-115.

Impact of Additional Factors on Vocabulary Development

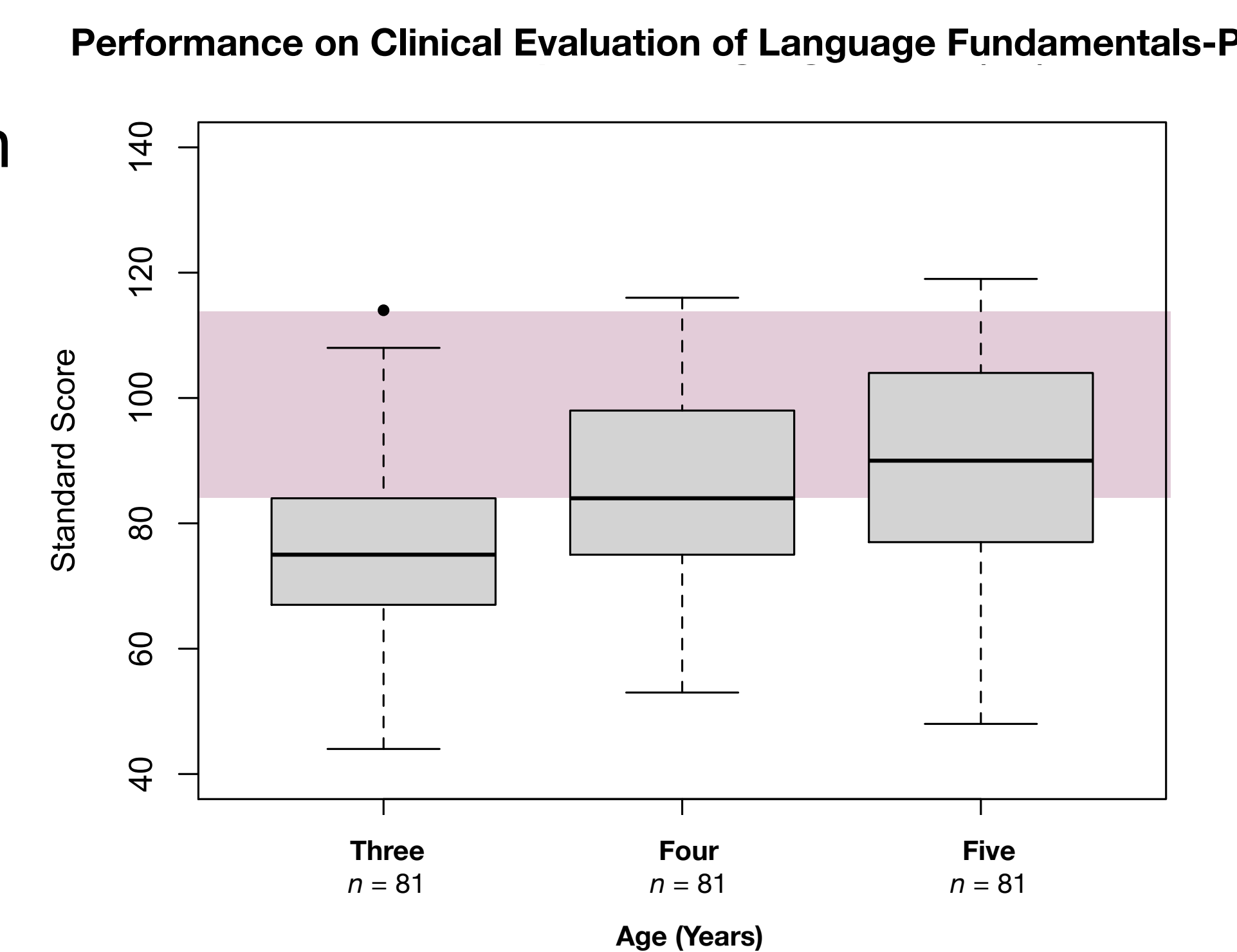
Development can be impacted by a variety of factors including presence of additional disabilities, prematurity, other medical diagnosis, etc. The combined effect of these additional factors on learning has been indicated in the LSL-DR for each child. The table below compares the scores of the children whose learning is not impacted by additional factors (DHH) and those whose learning is impacted (DHH+) at age five.

Percentile	DHH			DHH +		
	25th	50th	75th	25th	50th	75th
PPVT	87	99	107	77	88	100
EVT	93	102	113	86	96	104
ROWPVT	86	95	105	81	92	99
EOWPVT	84	95	105	73	85	94

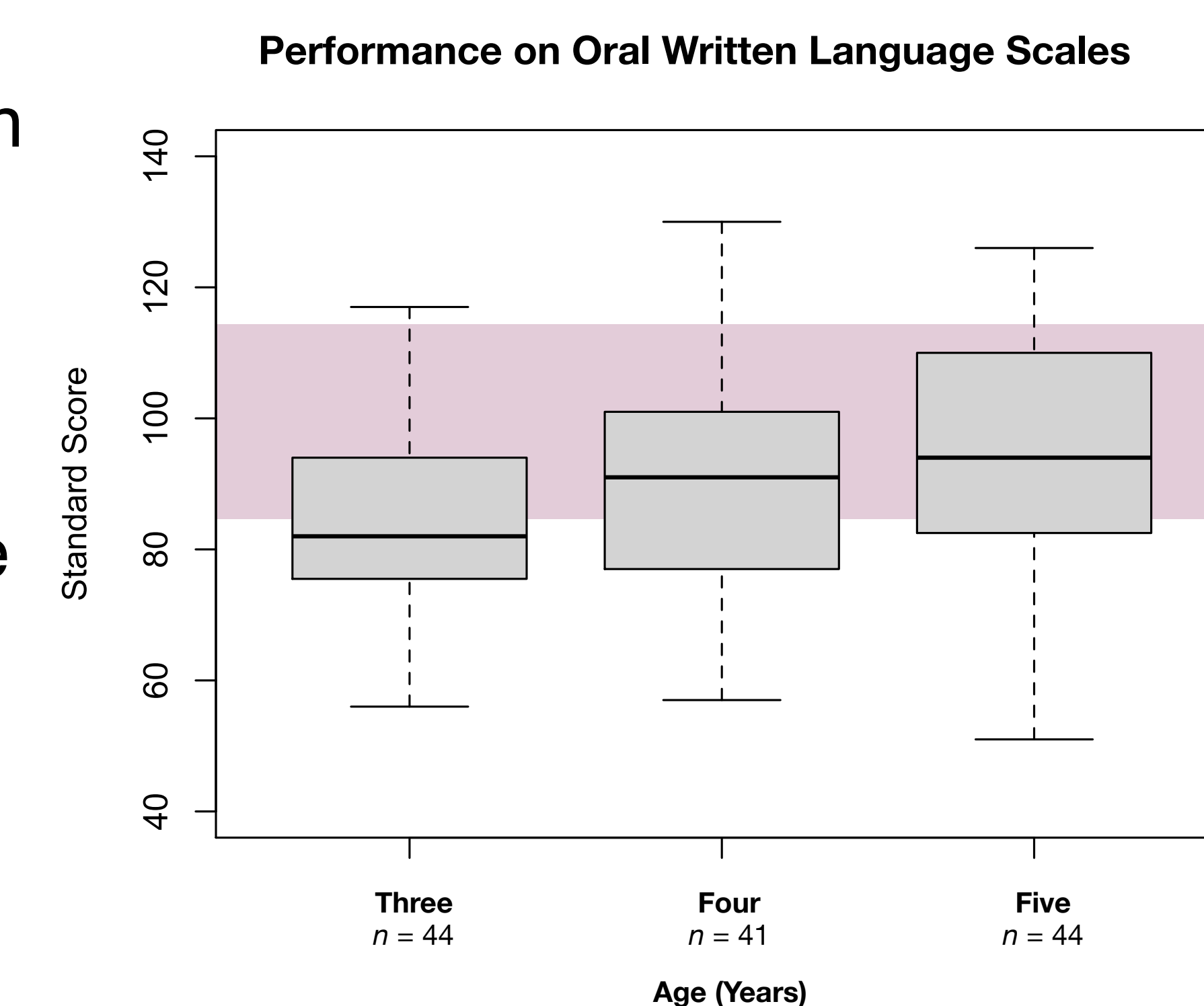
Language Growth Over Age 3 to 5 years

A review of performance on connected language assessments indicates a positive trend of growth in this domain from age three to five, with more than 50% of the sample demonstrating scores within the average range by age five years.

Longitudinal data were available for 81 children on the CELF-P. At age three years, approximately 75% of these children had below average language proficiency, but by age five years, more than 50% demonstrated average language proficiency compared to their hearing peers.



Longitudinal data were available for 44 children on the OWLS. At age three years, approximately 50% of these children had below average language proficiency, but by age five years, almost 75% demonstrated average language proficiency compared to their hearing peers.



Comparison between vocabulary and language growth of children who are DHH and attend OPTION programs is difficult given that data on language outcomes are available on only a subset of the sample.

However, these boxplots show that the median scores improved over the three year period, indicating that many children made more than a year's progress in year's time, similar to the vocabulary growth trajectories.

These box plots also demonstrate that even in a partial subset, variability in language outcomes at age five years, was greater than variability in vocabulary outcomes at age five years. This prompts additional investigation of factors and processes that impact connected language development in children who are DHH.

Conclusions

• In this sample of 404 children who are deaf or hard of hearing, learning to develop listening and spoken language, and attended an OPTION program, children demonstrated age appropriate receptive and expressive vocabulary proficiency by age five years.

- Children whose learning was impacted by additional factors also demonstrated improved vocabulary skills by age five.
- Language growth trajectories of a subset of 125 children from this sample also indicate growth over time. However, a fewer proportion of children demonstrated average language proficiency by age five years and there was more variability in outcomes.

These findings suggest that many children who are DHH and receive intervention in OPTION programs, are catching up to their hearing peers. They benefit from the specialized LSL intervention at an OPTION program. By age five years, many children transition to mainstream educational settings performing similarly to their hearing peers, while some children, need support to continue to "catch up" to their hearing peers.

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