

Development of Rhyme and Initial Sound Matching in Preschool Children with Hearing Loss



Emily Metze ♦ Krystal L. Werfel
University of South Carolina



ABSTRACT

This study examines the development of rhyme and initial sound matching ability in preschool children with hearing loss (CHL). Rhyme and initial sound matching skills of preschool CHL are compared to preschool children without hearing loss. Children are first assessed at age 4, then followed at 6-month intervals until age 6. Rhyme and initial sound matching measures are administered at each time point. Research and clinical implications will be discussed.

BACKGROUND

Despite recent technological advances in amplification for children with hearing loss, including digital hearing aids and cochlear implants, literacy achievement for this population has not increased over the past several decades (Qi & Mitchell, 2012). Some research has shown that children with hearing loss struggle more with word decoding than with reading comprehension (e.g., Geers & Hayes, 2011).

Phonological awareness skills are one important predictor of word decoding skills (e.g., Adams, 1990; Stahl & Murray, 1994). Phonological awareness is the ability of an individual to analyze and manipulate the sounds of spoken language (Mattingly, 1972; Wagner & Torgesen, 1987). Analyzing the sounds of words at the level of the phoneme, as opposed to rhyming skill, is seen by some researchers as the critical skill for later literacy success for children with normal hearing (Nation & Hulme, 1997; Hulme et al., 1998, 2002); however, other researchers have reported unique contributions of rhyme ability to later reading above and beyond phonemic awareness (e.g., Bryant, MacLean, Bradley, & Crossland, 1990; Bryant, 1998) and that only variance common with all phonological awareness skills, including rhyme, is related to word decoding (e.g., Anthony et al., 2002). We measure both types of skills in the present study.

Similar to children with normal hearing, phonological awareness is related to reading gain in children with hearing loss (Harris & Beech, 1998). However, there is widespread evidence that children with hearing loss struggle to develop phonological awareness skills commensurate with peers who have normal hearing (Ambrose, Fey, & Eisenberg, 2012; Easterbrooks, Lederberg, Miller, Bergeron, & Connor, 2007; Lund, Werfel, & Schuele, 2015). Previous work from our lab has shown that rhyming in particular is difficult for this population (Werfel, Douglas, & Ackal, 2016). Results from Werfel et al. indicated that, after a year-long intervention that targeted both rhyme and initial sound awareness, 89% of the children with hearing loss scored at or above the developmental range, but only 45% of the children with hearing loss did so for rhyme. Therefore, it is crucial to further elucidate the development of phonological awareness, particularly rhyming skills, in preschool children with hearing loss.

There is a critical need, therefore, to further elucidate the development of phonological awareness, particularly rhyming skills, in preschool children with hearing loss.

RESEARCH AIM

To compare developmental trajectories of two phonological awareness skills – rhyme matching and initial sound matching – in preschool children with hearing loss and preschool children with normal hearing.

METHOD

Participants

Participants were 16 preschool children with hearing loss (CHL; 8 boys) and 16 preschool children with normal hearing (CNH; 8 boys).

CHL: (a) have permanent bilateral hearing loss, (b) have auditory access to spoken language through the use of hearing aids or cochlear implants, (c) use spoken language only, (d) have no additional conditions known to affect language, cognition, or vision, such as Down syndrome, autism, or visual impairment, and (e) have English as the primary language at home.

CNH: (a) have bilateral normal hearing, (b) have no diagnosed conditions known to affect language, cognition, or vision, such as Down syndrome, autism, language impairment, or visual impairment, and (e) have English as the primary language at home.

Chi-square analysis indicated that gender, race, and ethnicity distribution did not differ between groups ($p = 1.0, .544, \text{ and } .129$, respectively).

Procedure

Children enroll in the ELLA study at age 4;0 (± 3 months) and participate in early language and literacy assessment every 6 months until age 6;0. At the 6;0 testing session, participants complete measures of early reading, writing, and spelling.

Of interest in the current proposal is participants' performance on Rhyme and Initial Sound measures at Times 1 through 5 and Reading and Spelling measures at Time 5.

Rhyme Matching Measure

The Rhyme measure is adapted from the Phonological Awareness Literacy Screening – PreK (PALS-PreK; Invernizzi, Sullivan, Meier, & Swank, 2004). Alternate forms are used at each Time. The examiner shows the child a picture of the target word and says it aloud. The examiner then shows the child three additional pictures, names them aloud, and asks the child to select the picture that rhymes or sounds the same at the end of the target word. Three practice items and ten test items are administered, and the child receives one point for each correct response (max 10).

Initial Sound Matching Measure

The Initial Sound measure is likewise adapted from the Phonological Awareness Literacy Screening – PreK (PALS-PreK; Invernizzi, Sullivan, Meier, & Swank, 2004). Alternate forms are used at each Time. The examiner shows the child a picture of the target word and says it aloud. The examiner then shows the child three additional pictures, names them aloud, and asks the child to select the picture that starts with the same sound as the target word. Three practice items and ten test items are administered, and the child receives one point for each correct response (max 10).

Table 1. Participant Demographic Information

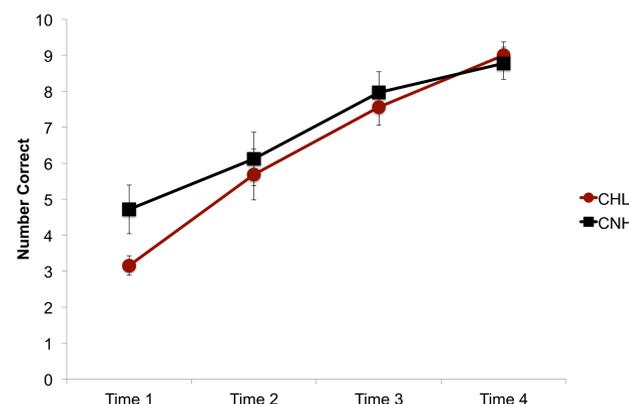
Group	n (boys)	Maternal Education in Years (SD)	Percent Minority	Amplification (CHL)
CHL	16 (8)	15.50 (2.46)	12.5	Bilateral CI: 9 Bilateral HA: 4
CNH	16 (8)	16.93 (2.37)	6.25	Bimodal: 2 BAHA: 1

Table 2. Performance by Group on Descriptive Measures

Tests	CHL Mean (SD)	CNH Mean (SD)	p
PTONI	110.50 (14.46)	117.81 (9.09)	.097
TELD-3 Receptive	100.06 (27.55)	118.88 (16.78)	.028
TELD-3 Expressive	85.56 (16.02)	103.50 (13.46)	.002
TELD-3 Overall	91.44 (25.47)	113.50 (16.62)	.099
Arizona-3	83.44 (10.63)	94.88 (12.93)	.010

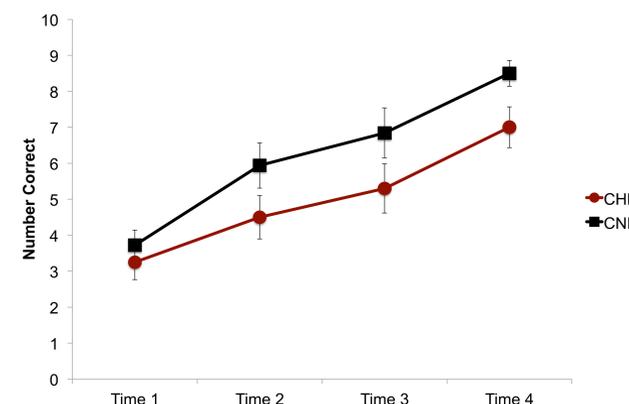
RESULTS

Rhyme Matching



Repeated measures ANOVA indicated a main effect of time, $F(3, 28) = 46.42, p < .001$, but not group, $F(1,30) = 0.93, p = .343$. The interaction of time and group was not significant ($p = .235$).

Initial Sound Matching



Repeated measures ANOVA indicated a main effect of time, $F(3, 28) = 33.27, p < .001$, and group trended toward significance, $F(1,30) = 4.12, p = .051$. The interaction of time and group was not significant ($p = .580$).

DISCUSSION

Both groups of children exhibited growth in phonological awareness skills over the 1.5 year span (4;0- 5;6); however the CHL group did not exhibit sufficient growth on the initial sound matching measure to catch up to their same-age CNH peers. In contrast, the CHL did exhibit sufficient growth to close the gap observed at Time 1 on the rhyme matching measure by the Time 2 assessment and maintained this performance through age 5;6.

The CHL group performed lower on the rhyme matching measure at Time 1; however, they exhibited growth across all four testing times. The CHL group showed rapid growth from T1 to T2 on rhyming skills and maintained growth consistent with the CNH group for the remainder of the study. This finding differs from previous research that showed that rhyme is a particular area of difficulty for children with hearing loss (e.g., Easterbrooks et al., 2007).

The CHL group's performance on the initial sound matching was similar to their CNH peers during Time 1 testing. Although CHL exhibited growth in initial sound matching, this growth was not sufficient to maintain skills similar to CNH over time. By Time 2, a gap in performance emerged, and this gap was maintained through age 5;6. This finding indicates that CHL perform differently depending on the specific phonological awareness skill being measured.

IMPLICATIONS

The findings from this study have important implications for research and clinical practice. CHL exhibited growth across both skills over time, but CHL did not exhibit growth rates in initial matching sufficient to maintain same-level performance as CNH. In rhyme, however, CHL appear to exhibit initial delay but experience rapid growth that closes this gap. Therefore, it appears that the acquisition of phonological awareness skills for CHL may differ depending on the particular skill of interest.

Rhyming: CHL exhibited growth across the four time periods for rhyme matching. These data show that CHL may catch up to their CNH peers on rhyme matching tasks at approximately age 4;6. All CHL in this study were receiving speech-language services at age 4. These data suggest that current practice may be effective for scaffolding rhyme matching skills in CHL.

Initial Sounds: At Time 1, no difference on initial sound matching was observed between CHL and CNH; however, both groups scored at approximately chance levels. By Time 2, a gap in performance had emerged between groups. After Time 2 CHL show a growth over time similar to the CNH peers, and the gap did not close by age 5;6. Thus, the opposite pattern of performance was observed on initial sound matching for CHL compared to rhyme matching.

Overall, these findings show that CNH and CHL exhibit growth over time on phonological awareness, specifically on rhyme and initial sound matching. In the future, intervention for initial sounds should begin early and be explicitly taught in order to attempt to close the gap between CHL and their same-age CNH peers. Future studies should examine how earlier intervention affects the age at which/if the CHL group catches up for these initial sound matching. Future work should also examine other phonological awareness skills.

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References available upon request: werfel@sc.edu