Critical Review:
What are the effects of an early phonological awareness intervention program on later literacy development for children with a speech and/or language impairment?

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This critical review examines the evidence regarding early phonological awareness intervention and its effects on literacy development for children with a speech and/or language impairment. Study designs include two mixed (between and within) nonrandomized clinical trials and one single group, pre-post treatment. Overall, research findings indicate that providing early phonological awareness intervention facilitates literacy development in this population. Recommendations for future research and clinical implications are also discussed.

Introduction

There is widespread agreement in the literature that phonological awareness, the ability to analyze the sound structure of language, lays the foundation for successful literacy development (Al Otaiba, Puranic, Ziolkowski, & Montgomery, 2009). Phonological awareness is a multi-level skill that encompasses skills that appear to draw from the same knowledge base (Scheuele & Boudreau, 2008). Scheuele and Boudreau (2008) describe skills such as rhyming, syllable awareness, and matching words with the same beginning sounds, to be at the simplest, most shallow level of phonological awareness. While at a deeper, more complex level, phonological awareness skills require isolation and manipulation of phonemes, called phoneme awareness. Skills at the phoneme level have been found to be the most critical for literacy development (Gillon, 2005). The more sensitive a child is to the phonological structure of words, especially at the phoneme level, the better the reader he or she is capable of becoming (Al Otaiba et al., 2009). As children begin to develop awareness that spoken words are composed of individual phonemic segments independent of their meaning, phoneme to grapheme relationships or decoding abilities will be more easily associated and learned.

Phonological awareness ability, as early as preschool, is a powerful predictor of later literacy success (Gillon, 2005). Children with communication disorders are often among the children identified with poor phonological awareness, putting them at risk for literacy difficulties (Scheuele & Boudreau, 2008). Research on children with language impairments has shown that they are at a far greater risk for reading disability than typically developing children and those early literacy deficits will persist throughout later school years. Moreover, children with speech impairments, especially severe and persistent disorders of articulation and phonology, in the absence of language impairment, are also at risk of a literacy disability (Gillon, 2005).

Given the strong relationship between phonological awareness skills in the emergent literacy stages and future literacy ability, intervening with phonological awareness training as soon as possible should facilitate future literacy development. Few studies have evaluated the long-term effects of early phonological awareness training on this population in later grades once formal literacy training has commenced.

Objectives

The primary objective of this paper is to critically review the existing literature investigating the effects of early phonological awareness intervention on later literacy development of children with a speech and/or language impairment. Most of the literature has focused on the effects of phonological awareness intervention for typically developing children, evaluated changes in phonological awareness skills only, measured literacy performance immediately post-treatment, or intervened once the children had already started formal reading instruction. The selected studies for

this review provide unique analyses in that they are all longitudinal in design and assess literacy skills specifically. The secondary objective of this paper is to propose evidence-based recommendations for clinical practice and to suggest areas for future research.

Methods

Search Strategy

Computerized databases including PubMed, JSTOR, ERIC, CINAHL, SCOPUS, and ProQuest Education Journals were searched. The following search strategy was used: (phonological awareness) AND (intervention OR program OR training) AND ((speech impairment) OR (language disorder) OR (language delay) OR (phonological disorder)). No limitations were set. The yielded results of the search were limited. Reference lists of retrieved articles were reviewed to find additional relevant articles.

Selection Criteria

Studies selected for inclusion in the review were required to examine the effects of a phonological awareness intervention program for children with a speech and/or language impairment, specifically within the preschool or kindergarten age group. Studies must have looked longitudinally at literacy development in these same children in future grades.

Data Collection

Results of the literature search yielded three articles that met selection criteria. The articles included two mixed (between and within) nonrandomized clinical trials (Gillon, 2005; Warrick, Rubin, & Walsh, 1993), which are considered to be Level 2a research evidence. Also included is a level 3, single group, pre-post treatment two-part study (Bernhardt & Major, 1998, 2005).

Results

Study 1: Warrick et al. (1993) examined the effect of small group phonemic awareness training for kindergarten children with a language delay. Participants included 42 kindergarten children who were grouped into 3 groups of 14 according to their language ability: participants with a language delay who would receive training, participants with a language delay who would not receive training, and a control group with typical language, who also did not receive training. Language abilities and phoneme awareness were measured using well-accepted standardized tests. At baseline, phoneme awareness abilities did not differ between the two language-delayed groups and were higher for the typically developing control group.

The treatment group participated in a program that lasted 8 weeks, with 2 sessions per week, and 20 minutes each session. The training program was composed of four phonemic-based components: syllable awareness, initial phoneme segmentation, rhyming, and phoneme segmentation. The sequence of activities followed the progression of phonological awareness skills that has been outlined in past research. The researchers appropriately used an analysis of variance (ANOVA) to compare group differences post-treatment. It was found that the participants with a language delay in the training group made significantly higher gains on phonological awareness tasks, while both control groups made no significant gains. After the intervention, there were no significant differences in phonological awareness skills between the normal controls and the training group.

One year later, participants were assessed on measures of real-word and non-word reading, as well as reassessed on phonological awareness skills. An ANOVA with post hoc testing was appropriately used to examine the group differences. Both the participants with a language delay who received training and the normal controls performed significantly better than the participants with language delay control group on phonological awareness skills, as well as real word and non-word reading.

A limitation of the study was the small sample size. Additionally, participant ages were not provided; participants were described as being in kindergarten. Furthermore, each participant's attendance and number of intervention sessions received were not described, leaving the amount of intervention required for impact to be unknown.

Despite these limitations, the study was well formulated, provided matched controls for the experimental group, and statistical tests were employed and appropriate. Overall, the validity of the study is suggestive. The clinical importance is compelling, as the focus on phoneme awareness in

training appeared to have advanced the children with a language delay to the level of the typically developing children in reading both real words and non-words.

Study 2: Gillon (2005) conducted a study that examined the long-term effects of phonological awareness intervention in preschool children with moderate or severe speech impairment. In the first phase of the study, 12 children with speech impairment in the absence of any other disability, between 3;00 and 3;11, participated in an experimental group. The intervention consisted of approximately 25.5 intervention sessions, 2 times per week for 45 minutes each session. Intervention focused on improvement of speech intelligibility, phonological awareness, including phoneme detection, phoneme categorization, initial phoneme matching, and phoneme isolation, as well as letter knowledge training. Letter-name and letter-sound knowledge were slowly integrated into the sessions using recognition activities.

Three years later, the experimental group was compared to a control group of participants with speech impairment who had not received phonological awareness intervention during their preschool or school program. Performance on phonological awareness, word recognition, spelling, and non-word reading measures were compared using an appropriate ANOVA. Results revealed statistically higher scores for the experimental group compared to the control group on all measures.

Sample size and effect size post hoc analyses were performed to determine whether significant differences between the experimental group and the control group might generalize to the larger population. A meaningful difference was detected for three of the four variables: phoneme awareness, word recognition, and nonword reading measures. The spelling measure needed a larger sample size to attain a meaningful difference.

Each participant's performance was compared to normative databases on word recognition performance. All of the participants in the experimental group were reading at the average or above average level for their age, while the majority of the participants in the control group performed below average.

While the outcomes are encouraging, the findings would be more compelling with a larger sample size. Additionally, all of the participants received a different number of hours of therapy because the number of blocks given was dependent on their speech production needs. However, the validity of the study is compelling, as the number of strengths of the study greatly outweighs the limitations. The methods and participant criteria were specified prospectively, control groups were carefully matched to the experimental group on all characteristics, measures were valid and reliable, treatment fidelity was reported, and the intervention program was described in sufficient detail for replication. The study provides compelling evidence for the benefits of integrating phonological awareness skill training into therapy sessions for preschoolers who have speech impairment.

Study 3: Bernhardt and Major reported two studies: an exploratory study (1998) and a follow up study (2005) that provided a more detailed analysis of predictive variables. In their first study, the researchers investigated the relationship between phonological and metaphonological skills in children with moderate to severe phonological disorders, as well as the short-term effects of intervention on children's awareness skills. The researchers used an alternating treatment design, where participants acted as their own controls. Nineteen children with a mean age of 3;11 participated in the study. Participants were labeled as 'disordered' rather than 'delayed' because they all had abnormal phonological substitution patterns.

Treatment consisted of 48 individual sessions, 45 minutes each, 3 times a week, over 16 weeks. The first two blocks of therapy focused on phonological goals, while the third block focused on phonological and explicit metaphonological goals, such as rhyming, alliteration, and segmentation. Participant's word and phonological awareness skills were reassessed following phonological intervention only and following phonological plus metaphonological intervention. Non-parametric statistical analyses were appropriately utilized for nominal or ordinal data collected and parametric analyses were used for higher-level distributed data collected.

Results suggested that participants with phonological disorders could improve their phonological awareness skills. However, performance on tasks was highly variable. Even when participants had similarities in their phonological productions, they performed differently on phonological awareness tasks in unpredictable ways. Additionally, nine of the children improved their phonological awareness skills after the phonological intervention alone. Bernhardt and Major suggested that focused practice on phonology might indirectly influence the acquisition of phonological awareness skills.

Three years later, Bernhardt and Major (2005) followed 12 of the participants from their earlier study to document their speech, language, and literacy skills, while trying to determine potential relationships between different factors. Participants were given a comprehensive assessment that included phonology, word discrimination, metaphonology, language comprehension, language production, verbal memory, non-verbal skills, reading, spelling, and arithmetic. No control group was used so standardized tests served as normative references. Only descriptive statistics were reported, meaning that the analysis of the data was not as strong as if statistical analysis had been employed. However, it was appropriate for this study

All 12 participants scored average to low average on vocabulary language measures, 7/12 had average or above average scores on tests of articulation, 9/12 scored within one standard deviation on metaphonology, 10/12 scored average or above average on reading recognition (decoding) and reading comprehension, and 7 scored average or above average on spelling

Pearson correlation coefficients were derived between early scores and scores at the follow-up point. The only variable that was statistically correlated with later reading and spelling skills was post-intervention metaphonology. If participants did not benefit from the metaphonological intervention, they were more likely to be delayed in literacy development.

Although most children scored within normal limits of speech, language, and literacy, the researchers suggested that explicit metaphonological instruction might be necessary for only some children to help them acquire literacy skills. This was due to the considerable amount of individual variation found between the participants. The researchers recommended that each child's metaphonological abilities be monitored and to focus treatment explicitly on metaphonology only when the child requires it.

Due to the low level of evidence of the research design, the use of nonparametric tests, the absence of a control group, and large variability in the results, the evidence of the study is suggestive. However, the clinical importance is compelling as it raises awareness that each child responds differently to phonological awareness intervention and the amount of impact for two children with similar profiles may vary.

Discussion

Taken together, these studies provided promising evidence that delivering phonological awareness intervention to children with a speech and/or language impairment, as early as their preschool years, benefits their future academic success, particularly in the area of literacy. The results of the three studies suggested that children who were initially at risk of a reading disability improved to the level of their typically developing peers. However, caution is warranted when interpreting results that phonological awareness intervention is causative of future literacy success. Common methodological issues that arose in these studies and suggestions for future studies are discussed.

First, small sample sizes were found within all of the studies. Smaller sample sizes allow less confidence that results are accurate, while larger sample sizes are more representative of the population and allow for greater confidence in results. Furthermore, larger sample sizes would allow researchers to learn more about different treatment interaction variables, such as age, gender, language ability, and behavior (Al Otaiba et al., 2009). The experimental design used in these studies also poses a limitation, as they all provide a lower level of evidence. A higher quality design for future studies, such as a randomized clinical trial, would allow for fewer opportunities for selection bias to influence the outcomes and increase the validity of the study.

The variability in both the selection criteria of participants and the intervention program provides a limitation in generalizing findings across studies. The assessment tools used to determine eligibility for inclusion differed amongst the studies and consequently the participants' profile pre-treatment were highly variable. Additionally, the measures to determine performance post-treatment also varied. For example, for real word measurements alone, all three studies used a different assessment test; Gillon (2005) used the *Burt Word Reading Test-New Zealand Revision* (Gilmore, Croft, & Reid, 1981), Bernhardt and Major (2005) used the *Peabody Individual Achievement Test-Revised* (Dunn & Markwardt, 1989), while Warrick (1993) used the *Woodcock Reading Mastery Tests-Revised* (Woodcock, 1987). This variation in measurement makes it difficult to determine the consistency of gains made between the different studies. Although difficult, future studies should use consistent assessment tools and measure similar aspects of phonological awareness and literacy.

Another variation between the studies that raises concern would be the large differences in the intervention programs. The total number of hours of instruction varied from approximately 5.5 hours (Warrick et al., 1993) to 6-9 hours (Gillon, 2005) to 36 hours (Bernhardt & Major, 1998). The focus and difficulty of the program also varied between studies, with a differing amount of attention paid to phonological awareness. As phonological awareness is a broad and multi-level skill, the programs all differed in which aspects would be taught and used different methods to teach these skills. Gillon and Bernhardt and Major both combined phonological intervention with phonological awareness intervention at higher level phoneme awareness tasks, while Warrick started intervention at a more shallow level, consisting of syllable awareness and rhyme, and progressed to more phoneme-based activities. Additionally, in Gillon's treatment program, letter knowledge was taught to the participants and incorporated into the activities. The large variability in hours, activities, measurement, and method of teaching makes it difficult to generalize findings across the studies. In order to conduct consistent interventions between different researchers, specific phonological awareness skills that have the greatest affect on literacy must first be explored in order to unify programs.

Conclusion

Research determining the long-term literacy effects of early phonological awareness training for children with a speech and/or language impairment is limited. The clinical review suggests that early intervention resulted in successful early literacy development in later grades. Although some of the evidence was suggestive and the studies reviewed were all different in methodology, results suggested that these children improved to the level of their typically developing peers in not only measures of phonological awareness, but in literacy measures as well. Consistency in the methods of future studies will prove beneficial in determining the existence of a more predictive relationship. These studies may provide a foundation for future research.

Clinical Implications

Review of the literature demonstrated some common conclusions that speech-language pathologists should take into consideration when treating these populations.

1. The importance of early intervention of phonological awareness skills; all three studies provided evidence that children as young as 3 years improved in their phonological awareness skills post-intervention.
2. Speech-language pathologists may assume that children with a speech and/or language impairment are at risk of a reading disability. Incorporating phonological awareness activities within their speech or language program may be beneficial for future literacy development.
3. There is large individual variation in response to intervention (Bernhardt & Major, 1998, 2005). Monitoring the child's progress and individualizing phonological awareness treatment activities may be valuable.

As literacy is a crucial aspect for academic achievement, speech-language pathologists should help facilitate and support the foundation of these skills in their practice whenever possible.

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