PROMOTING ALPHABETIC SKILLS OF YOUNG CHILDREN WITH HEARING LOSS IN CO-ENROLLMENT VERSUS INDIVIDUAL INCLUSION

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Abstract
The study assessed the efficacy of an early literacy intervention for 79 children ages 5-6 years with prelingual hearing loss (HL) who all functioned auditorily, using appropriate devices. Teachers and speech therapists administered an 8-month-long intervention in preschools through two alphabetic sessions and one storybook-reading session per week. Alphabetic sessions involved games and activities that encouraged letter knowledge, phonological awareness, and functional writing. Storybook-reading sessions utilized children's books to discuss central concepts and ideas via games and creative activities. The study compared two educational inclusion tracks: individual inclusion (a single student with HL fully integrated into a regular classroom) and co-enrollment (a group of students with HL partially integrated into a regular classroom and co-taught by a regular teacher and a special education teacher). Another group of children with HL studying in a co-enrollment track served as a control group. Children's alphabetic skills (letter naming, orthographic awareness, phonological awareness, and word writing) were assessed at pretest and posttest. Results showed that participants progressed more in the intervention groups than in the control group on phonological awareness and word writing, regardless of inclusion track. Interestingly, the two intervention groups did not differ in their progress.

Keywords: early literacy intervention, letter knowledge, phonological awareness, functional writing, educational tracks, storybook-reading.

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Chinese
[Translation Shek Kam Tse]
此項研究評估79名5-
6歲語言能力之前聽力喪失但可以通過輔助設備獲得聽力的兒童的早期識字干預的效果。教師和語言治療師在學前班進行了8個月的干預，每週進行兩次字母課和一次故事課。字母課利用遊戲和活動鼓勵字母認識、語音意識和訓練思維的寫作，故事課則是通過遊戲和活動利用兒童故事書討論中心概念和思想。此項研究對比了兩種全納教育方式：個體全納（單個聽力喪失兒童完全在普通課堂上課）和群體全納（一組聽力喪失兒童與普通班級半相容，由普通教師和特殊教育老師共同上課），另外還有一組群體全納的聽力正常兒童作為對比控制組。研究對兒童的字母能力（字母名字、拼音意識、語音意識和單詞寫作）進行了前測和後側，結果顯示，干預組的參與者，無論哪種全納方式，在語音意識和單詞寫作方面都比控制組進步快。有意思的是，這兩個干預組在進步上沒有區別。

Dutch
[Translation Tanja Janssen]
TITEL. Het bevorderen van alfabetische vaardigheden van jonge kinderen met hoorproblemen die gezamenlijk zijn ingeschreven versus individueel zijn toegelaten
SAMENVATTING. Het onderzoek stelde de effectiviteit vast van een vroegtijdige interventie op het gebied van geletterdheid voor 79 kinderen in de leeftijd van 5 tot 6 jaar met vroeg gehoorverlies (HL) die allemaal konden functioneren met gebruik van passende hulpmiddelen. Docenten en spraakleraren voerden gedurende 8 maanden een interventie uit op kleuterscholen, door twee sessies rond het alfabet en een leessessie per week. De sessies rond het alfabet behelsden spelletjes en activiteiten gericht op kennis van letters, fonologisch bewustzijn en functioneel schrijven. In de leessessies werden kinderboeken gebruikt om centrale concepten en ideeën te bespreken via spelletjes en creatieve activiteiten. In het onderzoek werden twee *educational inclusion tracks* met elkaar vergeleken: individuele inclusie (waarbij een individuele leerling met hoorproblemen volledig geïntegreerd is in een gewone klas) en *co-enrollment* of gezamenlijke inschrijving (waarbij een groep leerlingen met hoorproblemen gedeeltelijk geïntegreerd is in een gewone klas en daarbij onderwijs krijgt van een gewone docent en speciaal-onderwijs-docent). Een andere groep leerlingen met hoorproblemen in een *co-enrollment track* vormde de controlegroep. De alfabetische vaardigheden van de kinderen (noemen van letters, orthografisch bewustzijn, fonologisch bewustzijn en het schrijven van woorden) werd getoetst bij de voor- en natoets. De resultaten lieten zien dat deelnemers meer vooruitgingen in de interventiegroepen dan in de controlegroep in fonologisch bewustzijn, woorden schrijven, ongeacht *inclusion track*. Opmerkelijk was dat de vooruitgang in de twee interventiegroepen niet van elkaar verschilde.
TREFWOORDEN: interventie op het gebied van ontluikende geletterdheid, kennis van letters, fonologisch bewustzijn, functioneel schrijven, *educational tracks*, lezen van kinderboeken.

French
[Translation Laurence Pasa]
TITRE. Favoriser les compétences alphabétiques des jeunes enfants malentendants par la co-intégration ou l'intégration individuelle
RÉSUMÉ. Cette étude évalue l'efficacité d'une expérience d'alphabétisation précoce réalisée auprès de 79 enfants malentendants pré-lingual âgés de 5-6 ans. Des enseignants et des orthophonistes ont réalisé une intervention de 8 mois dans des écoles maternelles à raison de deux séances sur les connaissances alphabétiques et une séance de lecture d'histoires par semaine. Les séances sur l'alphabet sont menées au travers de jeux et d'activités en lien avec la connaissance des lettres, la conscience phonologique et les fonctions de l'écrit. Lors des séances de lecture d'histoires, des livres de jeunesse sont utilisés pour aborder des contenus et des idées via des jeux et des activités créatives. L'étude a comparé deux types d'intégrations éducatives : l'intégration individuelle (un élève malentendant seul entièrement intégré dans une classe normale) et la co-intégration (un groupe d'élèves malentendants partiellement intégré dans une classe normale et co-dirigé par un enseignant classique et un enseignant issu de l'enseignement spécialisé). Un autre groupe d'élèves malentendants en situation de co-intégration a servi de groupe témoin. Les

compétences alphabétiques des enfants (la connaissance du nom des lettres, la conscience orthographique, la conscience phonologique et l'écriture de mots) ont été évaluées lors d'un pre-test et d'un post-test. Les résultats montrent que les participants ont davantage progressé dans les groupes expérimentaux que dans le groupe témoin sur la conscience phonologique et l'écriture de mot, indépendamment du type d'intégration. Curieusement, les progrès réalisés dans les deux groupes expérimentaux ne diffèrent pas.
MOTS-CLÉS : expérience d'alphabétisation précoce, connaissance des lettres, conscience phonologique, fonctions de l'écrit, pistes éducatives, lecture d'histoires.

German

[Translation Irene Pieper]

TITEL. Die Förderung der alphabetischen Fähigkeiten von Kindern mit Hörverlust bei Integration von Gruppen und bei individueller Inklusion

ZUSAMMENFASSUNG. Die Studie untersuchte die Effektivität einer Intervention im Bereich der frühen Literalisierung bei 79 Kindern zwischen fünf und sechs Jahren mit Hörverlust vor dem Spracherwerb, die alle über angemessene Mittel verfügten, um sich im hörenden Umfeld zu bewegen. Lehrkräfte und Sprachtherapeuten führten eine acht Monate lange Intervention in der Vorschule durch. Jede Woche wurden zwei Einheiten Alphabetisierung und eine Einheit mit Geschichten unterrichtet. Die Alphabetisierungseinheiten umfassten Spiele und Aktivitäten, die die Kenntnis der Buchstaben förderten, aber auch die phonologische Bewusstheit und das funktionale Schreiben. In den Einheiten zum Geschichten Lesen wurden Kinderbücher herangezogen, um im Rahmen von Spielen und kreativen Aktivitäten zentrale Konzepte und Ideen zu diskutieren. Die Studie verglich zwei verschiedene Formen inklusiver Erziehung: individuelle Inklusion (mit einem einzelnen hörbehinderten Lerner, der in eine normale Klasse integriert war) und Ko-Aufnahme (mit einer Grppe hörbehinderter Lerner, die partiell in eine normale Klasse integriert waren und von zwei Lehrkräften - mit und ohne sonderpädagogische Spezialisierung – unterrichtet wurden). Eine weitere Gruppe von Lernern in einem Gruppen-Integrationssetting bildete die Kontrollgruppe. Die alphabetischen Fähigkeiten der Kinder (Buchstaben Benennung, orthographische Bewusstheit, phonologische Bewusstheit und Wörter Schreiben) wurden in Prä- und Posttest erfasst. Die Ergebnisse zeigen, dass die Lernenden in beiden Interventionsgruppen mehr Fortschritte bei phonologischer Bewusstheit und beim Wörter Schreiben machten als in der Kontrollgruppe. Interessanterweise unterschieden sich die beiden Interventionsgruppen in ihrem Erfolg nicht.
SCHLAGWORTER: Intervention im Bereich der frühen Literalisierung, Buchstaben Kenntnis, phonologische Bewusstheit, funktionales Schreiben, unterrichtliche Inklusionsformen, Geschichten lesen

Italian

[Translation Manuela Delfino, Francesco Caviglia]

TITOLO. Promozione di competenze alfabetiche in bambini con deficit uditivo in situazioni di inclusione combinata a confronto con inclusione individuale

SOMMARIO. Questo studio valuta l'efficacia di un intervento precoce di educazione alla parola scritta, condotto con 79 bambini di 5-6 anni con deficit uditivo precoce, tutti dotati di funzionalità uditiva in presenza di opportuni dispositivi. Insegnanti e terapisti del linguaggio hanno somministrato in contesto pre-scolastico un intervento della durata di otto mesi basato, ogni settimana, su due sessioni di alfabetizzazione e una di lettura di storie. Le sessioni di alfabetizzazione comprendevano giochi e attività che incoraggiavano conoscenza delle lettere, consapevolezza fonologica e scrittura funzionale. Le sessioni di lettura di storie utilizzavano libri per bambini per discuterne idee e concetti centrali per mezzo di giochi e attività creative. Il nostro studio ha messo a confronto due percorsi di inclusione educativa: inclusione individuale (un singolo studente con deficit uditivo completamente integrato in una classe regolare) e inclusione combinata (un gruppo di studenti con deficit uditivo parzialmente integrati in una classe "normale", con insegnamento in co-presenza di un insegnante disciplinare e uno di educazione speciale). Un altro gruppo di bambini con deficit uditivo, inseriti in un percorso di educazione combinata, fungeva da gruppo di controllo. Le competenze alfabetiche dei bambini (lettura a voce alta di lettere, competenza ortografica, competenza fonologica e scrittura di parole) sono state valutate prima e dopo l'intervento. I risultati hanno mostrato che i partecipanti hanno ottenuto maggiori progressi nei gruppi che hanno partecipato all'intervento rispetto al gruppo di controllo per quanto riguarda consapevolezza fonologica e scrittura di parole, indipendentemente dal tipo di percorso di inclusione. È significativo che non ci siano state differenze nella progressione nei due gruppi ai quali è stato amministrato l'intervento.

PAROLE CHAIVE: interventi di alfabetizzazione precoce, conoscenza delle lettere, consapevolezza fonologica, scrittura funzionale, percorsi educativi, lettura di storie

Polish

[Translation Elżbieta Awramiuk]

TITUŁ. Rozwijanie umiejętności alfabetycznych małych dzieci z ubytkami słuchu poprzez włączenie integracyjne i indywidualne

STRESZCZENIE. Badanie oceniało efektywność interwencji we wczesną umiejętności czytania i pisania ma 79 dzieci w wieku 5-6 lat z prelingwalną utratą słuchu (HL), które funkcjonowały słuchowo, wykorzystując odpowiednie urządzenia. Nauczyciele i logopedzi prowadzili w przedszkolach ośmiomiesięczny eksperyment, podczas którego tygodniowo odbywały się dwie sesje alfabetyczne i jedna sesja czytania książek. Sesje alfabetyczne zawierały gry i zabawy, które rozwijały wiedzę o literach, świadomość fonologiczną i funkcjonalne pisanie. Sesje z czytaniem opowiadań wykorzystywały dziecięce książeczki do dyskusji o ich treści poprzez zabawy i działania twórcze. W artykule porównano dwie drogi edukacyjnego włączania: indywidualne włączanie się (pojedynczy uczeń z HL w pełni zintegrowany ze stałą klasą) oraz włączenie integracyjne (grupa uczniów z HL częściowo zintegrowana ze stałą klasą i wspólnie uczona przez stałego nauczyciela i nauczyciela edukacji specjalnej). Inna grupa dzieci z HL uczona integracyjnie posłużyła jako grupa kontrolna. Dziecięce umiejętności alfabetyczne (nazywanie liter, świadomość ortograficzna, świadomość fonologiczna i pisanie wyrazów) były testowane na początku i na koniec badań. Rezultaty dowodzą, że uczestnicy zrobili większy postęp w grupach eksperymentalnych niż w grupie kontrolnej w zakresie świadomości fonologicznej i pisania wyrazów, niezależnie od sposobu włączania. Co interesujące, nie było różnic w postępach między dwiema grupami eksperymentalnymi.

SLOWA-KLUCZE: interwencja we wczesny etap nauki czytania i pisania; wiedza o literach; świadomość fonologiczna; funkcjonalne pisanie; ścieżki edukacyjne; czytanie opowiadań

Portuguese

[Translation Sara Leite]

TITULO. Promoção de competências alfabéticas em crianças pequenas com perda de audição em co-frequência versus inclusão individual

RESUMO. Pretendeu-se aferir a eficácia de uma intervenção precoce de literacia em 79 crianças com idades entre 5-6 anos com perda de audição pré-lingual (PA) que conseguiam funcionar auditivamente, com a ajuda de aparelhos. Professores e terapeutas da fala procederam a uma intervenção de 8 meses na educação pré-escolar em duas sessões de alfabetização e uma sessão de leitura de histórias por semana. As sessões de alfabetização envolveram jogos e actividades que promoviam o conhecimento das letras, a consciência fonológica e a escrita funcional. As sessões de leitura de histórias faziam uso de livros infantis para discutir conceitos e ideias centrais através de actividades criativas e lúdicas. O estudo comparou duas vias de inclusão educativa: a inclusão individual (uma única criança com PA completamente integrada numa classe regular) e a co-frequência (um grupo de alunos com PA parcialmente integrados numa classe regular e co-orientados por um professor regular e um professor de educação especial). Um outro grupo de crianças com PA frequentando o ensino em modo de co-frequência serviu de grupo de controlo. As competências alfabéticas das crianças (nomeação das letras, conhecimento ortográfico, conhecimento fonológico e escrita de palavras) foram avaliadas num pré-teste e num pós-teste. Os resultados indicaram que os participantes progrediram mais nos grupos de intervenção do que no grupo de controlo, em termos de conhecimento fonológico e escrita de palavras, independentemente da respectiva via de inclusão. Curiosamente, os dois grupos de intervenção não apresentaram diferenças no seu progresso.

PALAVRAS-CHAVE: Intervenção precoce de literacia, conhecimento de letras, consciência fonológica, escrita funcional, vias educativas, leitura de histórias.

Spanish

[Translation Ingrid Marquez]

TÍTULO. La promoción de las habilidades alfabéticas en niños pequeños con pérdida auditiva en co-inscripción vs. La inclusión individual

RESUMEN. El estudio evaluó la eficacia de las intervenciones de alfabetización tempranas para 79 niños de 5-6 años con pérdida de oído pre-lingual (HL); todos los sujetos tenían una función auditiva adecuada debido al uso de aparatos apropiados. Los maestros y terapeutas del habla administraron una intervención de ocho meses en pre-kinder por medio de dos sesiones alfabéticas y una sesión de lectura de cuentos

cada semana. Las primeras involucraron juegos y actividades que fomentaban el conocimiento de las letras, la conciencia de la fonología y la escritura funcional. Las sesiones de lectura de cuentos utilizaron los libros de los estudiantes para platicar sobre conceptos e ideas centrales por medio de juegos y actividades creativas. El estudio comparó dos sistemas de inclusión educativa: la individual (un solo estudiante con HL, completamente integrado en un salón de clases normal) y la co-inscripción (un grupo de estudiantes con HL, parcialmente integrado a un salón de clases normal pero co-enseñado, con la participación de un maestro de educación especial). Otro grupo de niños con HL inscritos en el sistema de co-inscripción sirvió como el grupo de control. Las habilidades alfabéticas de los niños (nombrar las letras, conocer la ortografía y fonología, escribir palabras) se evaluaron antes y después de los exámenes. Los resultados muestran que los participantes progresaron más en los grupos de intervención que en los grupos de control, con respecto a la conciencia de la fonología y la escritura de palabras, sin que importara el sistema de inclusión. Interesantemente, no hubo diferencias en el nivel de progreso entre los dos grupos con intervención.
PALABRAS CLAVE: intervención temprana en la alfabetización, conocimiento de las letras, conciencia fonológica, lectura de cuentos.

1. INTRODUCTION

This study assessed the effectiveness of an intervention program aiming to promote alphabetic skills of young children with hearing loss (HL). The systematic intervention was preplanned to meet the specific needs of children with HL and included a variety of age appropriate games and literacy activities. We compared the effectiveness of this intervention for children in two educational inclusion tracks: individual inclusion versus co-enrollment.

Early literacy is well acknowledged as providing the basis for reading and writing acquisition in school (National Reading Panel, 2000). Early literacy incorporates various skills, including linguistic and alphabetic aptitudes. Within the range of early literacy abilities, alphabetic skills often comprise the best predictors of reading and spelling achievements in school. This holds true across languages (e.g., Bowey, 1995; Bruck, Genesee, & Caravolas, 1997; Cardoso-Martins, 1995; de Jong & van der Leij, 1999; Ehri, Nunes, Willows, Yaghoub-Zadeh, & Shanahan, 2001; Muter, Hulme, Snowling, & Taylor, 1998, Levin, Patel, Margalit, & Barad, 2002; Shatil, Share, & Levin, 2000).

Children with HL lag behind their hearing peers in their literacy skills (Allman, 2002; Colin, Magnan, Ecalle, & Leybaert, 2004; Most, Aram, & Andorn, 2006) and are at risk for delays in reading comprehension and other language-based academic skills (Carney & Moeller, 1998). Reviewing the literature on deafness and reading, Musselman (2000) presented two major views to reading acquisition. One view claims that deaf children learn to read using the same processes as hearing children, leaning mainly on phonological processes. The other suggests that deaf individuals read using qualitatively different process, relying considerably on visual representations. Musselman claimed that "the body of evidence currently available supports the hypothesis that skilled reading by deaf students (like that of hearing students) involves phonological encoding" (p.13). Nonetheless, she asserted that more exploration is essential regarding effective means to help children with HL learn to read. In line with her suggestion, the current study expanded investigation of this issue.

Some evidence indicates that children with HL who enter first grade with good alphabetic skills acquire reading efficiency quicker than their peers with poorer skills

(e.g., Colin et al. 2004). Easterbrooks, Lederberg, Miller, Bergeron, and Connor (2008) found that children with HL generally showed gains similar to their hearing peers in knowledge of letter names and common written words, but lagged in phonological awareness skills. They showed that these alphabetic skills were systematically related to the children's literacy development, as found in children with typical hearing. The present study presents and assesses the effectiveness of an intervention designed to meet the special needs of children with HL and promote their alphabetic skills in two educational settings, co-enrollment and individual inclusion. It addressed the following alphabetic skills: letter knowledge, phonological awareness, writing and orthographic awareness.

1.1 Letter Knowledge

Young children's letter knowledge includes the abilities to name written letters, write letters, and relate a written letter to the sound that it represents. Letter knowledge in kindergarten comprises one of the best longitudinal predictors of learning to read in an alphabetic writing system (for a review, see Foulin, 2005). The studies of Levin and Bus (2003) and Levin and Ehri (2009) demonstrated how everyday activities in preschool (e.g., recognition of their own name and their friend's names on drawers, paintings, or bags) help children learn letters' names and sounds. Some evidence indicates that preschoolers with HL lag behind their hearing peers on letter naming (e.g., Most et al., 2006). Marschark, Lang, and Albertini (2002) stressed that strengthening the alphabetic knowledge of children with HL to an automatic degree can ease the load on their working memory and improve their reading. Easterbrooks et al. (2008) asserted that practicing alphabetic skills with young children is useful in improving their word identification skills.

1.2 Phonological Awareness

Phonological awareness refers to one's ability to recognize, discriminate, and manipulate the sounds in one's language (Anthony & Francis, 2005). It mediates between the sound segments of the spoken language and the orthographic segments of written language. Children with normal hearing acquire phonological awareness gradually, beginning with awareness of the syllable and followed by awareness of sub-syllables and phonemes (Goswami, 1999). Researchers generally concur that young children with HL evidence delays in phonological awareness (Allman, 2002; Colin et al., 2004; Lederberg, Easterbrooks, Malone Miller, Robin Page & McDonald Connor, 2008; Luetke-Stahlman, & Nielsen, 2003; Most et al., 2006); however, some research indicated only a more protracted learning phase (e.g., Spencer & Tomblin, 2009), whereas others claimed that these children's phonological awareness may develop in different ways (Sterne & Goswami, 2000). A low level of phonological awareness in children with HL hinders their early stages of learning to read (e.g., Goldin-Meadow & Mayberry, 2001). Children with HL who are able to develop an implicitly structured phonological knowledge before learning to read will

be better readers when this knowledge becomes explicit under the pressure of reading instruction (Colin et al., 2004).

1.3 Writing

Young children spontaneously engage in writing (e.g., Ferreiro & Teberosky, 1982), and their level of early writing predicts their later reading/writing achievements (e.g., Aram, 2005; Levin, Ravid, & Rapaport, 2001; McBride-Chang, 1998; Shatil et al., 2000). Mayer (2007) followed the early writing development of children with HL and reported that they understand the grapho-phonemic principle of writing and know that a relationship exists between speeches (or sign) and text. Schirmer (2000) studied language and literacy development in children who are deaf and asserted that she found no reason for different writing development processes among children who are deaf. Most et al. (2006) found that the writing achievements of kindergartners with HL who studied in individual inclusion did not differ from their hearing peers. Yet, in group inclusion, the achievements of hearing children were higher than that of children with HL. Researchers on deaf education emphasize the importance of early writing experiences and strongly recommend preplanned, systematic writing guidance (Akamatsu & Andrews, 1993; Nielsen & Luetke-Stahlman, 2002).

1.4 Orthographic awareness

Writing systems have specific conventions that govern the visual and orthographic aspects of print. Some orthographic constraints determine what letter combinations can constitute words. Others determine orientation and spacing constraints for printed language such as: Letters are not printed backwards or upside down, words do not contain spaces between letters, etc. Before a child can begin to read, he or she must acquire considerable knowledge about the orthographic aspects of his/her own language writing system (Levy, Gong, Hessels, Evans, & Jared, 2006). Among Israeli kindergartners, orthographic awareness was found to correlate with the later acquisition of reading and writing in first grade (Shatil et al., 2000). Most et al. (2006) assessed orthographic awareness among children with HL in co-enrollment and in individual inclusion and among hearing children. The two groups of children with HL did not differ significantly. Nevertheless, the hearing children exhibited significantly higher performance compared to the co-enrolled children with HL but not compared to the individually included children with HL.

1.5 Early Literacy Interventions for Children with HL

During the last decade, changes occurred in researchers' and educators' vision of developmentally appropriate literacy practices for young children. Two shifts transpired: First, recent practices now recognize the importance of direct formal guidance rather than a position favoring natural exposure to literacy. Second, literary practices have shifted from an emphasis mainly on general language abilities to a closer focus on alphabetic skills (Dickinson, 2002). Recent reports suggest that

nowadays children with HL have better chances to gain age appropriate literacy achievements due to improved speech perception skills resulting from newborn screening and advances in amplification technology, such as cochlear implants (Spencer & Oleson, 2008).

The few available studies that describe early literacy classroom interventions for HL children have centered on promoting language and literacy by means of interactive storybook reading. These studies usually used whole language techniques and included small samples (e.g., Andrews & Gonzales, 1992). Storybook reading poses difficulties with children who have HL (Williams, 2004). One difficulty lies in holding the book and signing at the same time, and another stems from the child's need to shift visual focus from the book illustrations to the reader's face and hands that are signing/speaking the printed words. Nevertheless, storybook reading provides an important, rich linguistic context through which children can enhance their spoken and/or signed language fluency.

Williams and McLean's (1997) intervention study examined the effectiveness of interactive storybook reading on 5 profoundly deaf children in a preschool class. The teacher systematically discussed the book with the children, encouraged the children to be active, asked questions, and related the story to the children's lives. The researchers videoed the children during 14 storybook reading sessions over a 4-month period and reported improvement in the children's interest and engagement in storybooks as well as in their comprehension. Gioia (2001) also reported the benefits of interactive storybook reading on children's language and behavior during book reading, using a multiple case study of 3 deaf preschoolers over a year. She found that by the end of the year, the children expanded their vocabulary and knowledge about print; furthermore, they felt more comfortable with the books, became familiar with appropriate behaviors while reading books, and participated more in the dialogue during book sharing.

Interventions focusing on alphabetic skills are rarer. Lederberg and her colleagues (Lederberg, 2008; Lederberg, Burke, Connor, & Easterbrooks, 2009) recently developed a curriculum for teachers and clinicians to teach young deaf children alphabetic competencies by embedding explicit instruction of phonic, phonological, vocabulary, and narrative skills in language-rich, visually-supported activities. Single-case studies indicated the effectiveness of the program in teaching phoneme-grapheme correspondences, rhyming, syllables, and initial sound segmentation for the majority of children. These researchers concluded that deaf children who have access to sound can acquire auditory-based early reading skills using an intervention based on effective techniques for hearing children, with some adaptations to the special needs of deaf children.

Evidence has shown that storybook reading and writing activities render differential effects on children's early literacy measures. To address these effects, Aram and Biron (2004) compared two literacy interventions implemented within preschools by graduate students: a storybook reading program that utilized children's books to focus on language and to practice major concepts elicited by these books, and a writing program that involved activities encouraging letter knowledge, phonological awareness, and functional writing. Results indicated that the preschoolers who participated in the writing program significantly outperformed both the partici-

pants in the storybook reading group and a control group on letter knowledge, phonological awareness, word writing, and orthographic awareness. In a second study, Aram (2006) examined the differential contributions of three preplanned, systematic intervention programs implemented by the preschool teacher – storybook, writing, and combined (storybook and writing) – on the language and alphabetic skills of preschoolers. In each program, the teacher worked with small groups of children twice a week for about 30 minutes. In the storybook reading or writing programs, she worked twice weekly on either storybooks or writing activities, respectively. In the combined program, she utilized activities from both programs, practicing storybook reading with the children once a week and writing activities once a week. Results indicated that the children in the three intervention programs progressed significantly more than those in a control group on alphabetic skills. Further, the children in the writing activities program outperformed the children in the other groups on alphabetic skills. Interestingly, the combined program enhanced participants' linguistic and alphabetic skills. It enhanced their alphabetic skills less than the writing program but more than the control and the storybook reading interventions. It also enhanced their language skills more than the other three interventions (including the storybook reading group).

In line with these results, in the current study we faced the challenge of designing a program that would include both storybook reading and alphabetic activities for children with HL. We adjusted an existing program (Aram, 2006) to the special characteristics and needs of these children. We developed the program (activities and assessments) together with researchers, clinicians, and preschool teachers of children with HL. The program was implemented in two different educational integration tracks, individual and co-enrollment.

1.6 Educational Inclusion Tracks

These days, more countries enforce early screening for infants' hearing. This screening promotes the early identification of children with HL and calls for their early placement in an appropriate inclusive educational setting (Katz & Schery, 2006). When selecting an educational setting, the learning opportunities each setting offers for each child should be considered; in particular, selection of an appropriate educational setting should consider the child's communication needs and preferred communication modes, linguistic needs, severity of HL, academic level, and social, emotional, and cultural needs. Additionally, consideration should be given to opportunities for peer interactions and communication.

The impact of educational setting on literacy levels of children with HL has received some empirical attention. Studies have underscored that individually included children (a single student with HL fully integrated into a regular classroom) perform better than children in co-enrollment (a group of students with HL partially integrated into a regular classroom and co-taught by a standard teacher and a special education teacher) regarding a number of different domains such as academic competencies (Gans, 1998; Paul & Quigley, 1990), communication abilities (Anderson, 1998), and social and emotional skills (Bilir & Bal, 1998; Farlow, 1996). One previ-

ous study (Most et al., 2006) comparing literacy in the two tracks indicated that kindergartners with HL in the individual inclusion program yielded better general knowledge, vocabulary achievements, letter naming, and phonological awareness, compared to children with HL in the co-enrollment program. No statistically significant differences emerged between the two settings in reading, writing, or orthographic awareness. The achievements of a control group of hearing children surpassed those of the co-enrolled children but did not differ statistically from those of individually included children.

1.7 The Current Study

In the present study, we aimed to promote the early alphabetic skills of preschoolers with HL. We implemented an 8-month-long early literacy intervention program in different preschools, assessed its efficacy, and compared its effectiveness on children in individual inclusion versus co-enrollment settings versus a control group that received no intervention. In the intervention, teachers and speech therapists administered alphabetic sessions (involving games and activities that encouraged alphabetic skills and functional writing) and storybook-reading sessions (utilizing children's books to discuss central concepts and ideas via games and creative activities) as part of the preschools' daily activities. Based on previous studies' results (e.g., Most et al., 2006), we developed the following hypotheses for these children with HL:

1) At pretest, children in the individual inclusion track will exhibit better performance in all alphabetic skill measures, compared to children in the co-enrollment track (both groups).
2) Children who participate in an intervention program (either individual inclusion or co-enrollment) will exhibit better progress in alphabetic skills (letter naming, phonological awareness, word writing, and orthographic awareness) after the 8-month intervention than their peers in the co-enrollment control group.
3) Children in the individual inclusion track of the intervention will progress more than their counterparts in the co-enrollment track of the intervention, on all the assessed measures.

2. METHOD

2.1 Participants

Table 1 presents the demographic characteristics of the participants in the three study groups. Participants comprised 79 normally developed children with HL (mean age: $M = 62.24$ months, $SD = 11.89$ months; see Table 1). All children were integrated into regular preschools for hearing children and attended the Society for the Education of Deaf Children's (MICHA) afterschool programs in Tel Aviv or Haifa. All of the children had prelingual/congenital HL. Regarding the degree of HL, 32 children had profound loss (> 91 dBHL), 18 children had severe loss (71-90 dBHL), 26 children had moderate loss (41-70 dBHL), and 3 children had mild loss (<40 dBHL). All the children in the study had access to sound and used amplification devices. The majority of the children wore hearing aids, and the minority had

cochlear implants (see Table 1). All the children were taught using oral communication that relied on their auditory accessibility. For those children who used total communication at home (see Table 1), the special educational teacher added signs when needed but the main communication mode was always aural/oral. None of the participants showed cognitive, emotional, or behavioral problems, according to teachers' reports.

Table 1. Demographic Group Characteristics: Comparisons by F or χ^2

Measure		Group			Statistics
		Co-enrollment comparison (N = 23)	Co-enrollment intervention (N = 33)	Individual inclusion intervention (N = 23)	
Child's age in months	*M (SD)*	60.34 (13.23)	60.75 (10.75)	66.26 (11.61)	F (2, 76) = 2.72, $p < 0.05$
Boys/girls	*n*	11/12	12/21	11/12	χ^2 (2) = 1.03, *ns*
Birth order	*M (SD)*	2.18 (0.85)	2.00 (0.86)	2.34 (0.88)	F (2, 76) = 1.10, $p > .05$
Degree of hearing loss: profound- severe-moderate-mild	*n*	7/7/8/1	16/10/6/1	9/1/12/1	χ^2 (6) = 10.82, *ns*
	%	31/31/34/4	49/30/18/3	39/5/52/4	
Mode of communication: spoken/total	*n*	13/9	23/10	23/0	χ^2 (4) = 13.77, $p < .005$
Hearing aids/cochlear implants	*n*	19/4	25/8	17/6	χ^2 (2) = 0.56, *ns*
Mothers' hearing status: hearing/deaf	*n*	19/4	29/4	22/1	χ^2 (2) = 1.96, *ns*
Siblings' hearing status: hearing/deaf	*n*	13/10	22/11	15/8	χ^2 (2) = 0.65, *ns*
Intact families/single mothers	*n*	19/4	27/6	23/0	χ^2 (2) = 4.71, *ns*
No. of children in family	*M (SD)*	3.13 (1.42)	2.85 (1.90)	2.82 (1.07)	F (2, 76) = 0.28, $p > .05$
Mother's age in years	*M (SD)*	35.53 (5.39)	33.31 (5.39)	36.22 (7.13)	F (2, 76) = 1.55, $p > .05$
Mother's education in years	*M (SD)*	12.41 (2.42)	12.66 (3.65)	13.47 (2.77)	F (2, 76) = 0.60, $p > .05$

Participants' rehabilitational and educational background. In Israel, young children diagnosed with HL enter formal educational settings at the age of 3 years. These settings, under the administrative supervision of the country's Ministry of Education, receive support and professional supervision from the MICHA Society for the Education of Deaf Children, a national non-profit early intervention agency that provides educational and rehabilitation services for young children with HL (ages 0-7 years) and for their families. The MICHA early intervention program furnishes auditory assessment and communication therapy to children as well as parental guidance and support to families. Parents receive information (lectures and literature) to help them develop a knowledge base for decision making and goal selection; they also receive guidance to establish parental expertise in raising a child with HL (e.g., audiologists guide parents in managing hearing aids; speech pathologists teach parents strategies to encourage communication), as well as emotional support to help parents cope with their child's special needs (by a psychologist or social worker). The keystone of MICHA's intervention program consists of early intervention at the

critical ages of childhood, along with family involvement in the habilitation process and the child's inclusion in as normal a setting as possible.

Participants' inclusive education settings. "Inclusion" often describes a method of educating children who need special education within a general education classroom in the school they would have attended if not disabled, with age-appropriate peers and with appropriate supports and services (Thompson et al., 2002). The preschool intervention program at MICHA offers two inclusion tracks: individual inclusion and co-enrollment.

The individual inclusion track, integrating children with HL into regular preschools in their local neighborhoods, serves approximately 50% of Israeli young children with HL. To meet criteria for this track, children's language level must approximate that of their hearing peers (cannot lag more than one year behind). In the individual inclusion model adopted by MICHA, the child with HL meets twice weekly with an itinerant speech therapist/special education teacher in the preschool setting. The child also attends the MICHA center twice weekly in the afternoons for additional therapy in areas such as language and speech or occupational therapy as well as participation in small groups of art or bibliotherapy with peers with HL, to share common feelings and deal with some self-esteem and identity issues. An expert in deaf education visits the preschool regularly to guide any preschool staff members who lack a special education background. Preschool staff also participate in professional workshops at the MICHA center that provide training in teaching and communicating with children with HL.

The *co-enrollment* track, integrating 6 to 10 children with HL as a group into a preschool with about 35 hearing children, serves approximately 50% of Israeli young children with HL. The children selected for the co-enrollment program evidence significant language delays and require more intensive education therapy than those eligible for individual inclusion. Children in the co-enrollment track are team-taught by two public education staff members: a typical preschool teacher and a teacher specializing in deaf education. The two teachers collaborate to carefully plan an integration schedule into the daily routine as well as to design developmentally appropriate activities for the children with HL that encourage active learning. Mainstreaming can occur in academic classes or during other times of day such as during lunch, gym, and free play. Both the children with HL and their hearing peers are available for social interaction. The constant presence of a special education teacher allows for consistent attention to the children's need for communication access. The co-enrollment model may potentially solve some of the difficulties inherent in the individual inclusion model because the special education teacher works as a full-time member of the team, not as a visitor. The special education teacher can integrate intensive and specialized instruction into the classroom curriculum. In addition to the classroom teacher's speech instruction, an itinerant speech therapist provides speech therapy services as needed. In their classes, children also receive occupa-

tional therapy or psychotherapy in individual and group sessions as needed. The entire preschool staff receives professional guidance from MICHA's experts.

Our sample comprised three groups: The individual inclusion—intervention (herein: II-I) group consisted of 23 children integrated into regular local preschools in their neighborhoods. The co-enrollment—intervention (herein: CO-I) group consisted of 33 children included in regular preschools within small groups of 6-10 children with HL. The co-enrollment—comparison (herein: CO-C) group consisted of 23 children from the co-enrollment track who did not participate in the intervention. The three groups did not differ in gender distribution or children's birth order, but the children in the II-I group were significantly older than the children in the CO-I and CO-C groups (see Table 1 for detailed demographic comparisons).

Intergroup demographic comparisons. As seen on Table 1, no significant differences emerged between the three study groups on children's degree of HL or on distribution of hearing aid versus cochlear implant users. The three groups did not differ significantly with regard to mother's age, number of children in the family, family's socioeconomic status determined according to maternal education level, or the distribution of parents or siblings with HL (see Table 1). Most of the families in the three groups were intact 2-parent families, and only a minority of the children had parents or siblings with HL. Regarding mode of communication at home, the II-I group, in which all of the children used spoken language, differed significantly from the two other groups, in which some of the children used spoken language and others used total communication (spoken language and sign language) (see Table 1).

2.2 The Intervention Program

To provide children and teachers some time to adapt to their preschool context, the intervention began in early November—2 months after the school year began--and lasted 8 months. The intervention followed the ideas and the structure of Aram (2006) but adapted the activities to the special needs of children with HL. The intervention was preplanned and maintained challenging goals (see Gersten & Brengelman, 1996; Marks & Gersten, 1998). The sessions followed a cumulative, developmental curricular progression over the year. All three weekly sessions were administered within the children's preschools either by a special education teacher or by a speech therapist (hereafter: the mediator). Every week, each child participated in two sessions that focused on alphabetic skills and one session that focused on storybook reading (see Appendix for sample sessions). Each session lasted between 20-30 minutes. In the CO-I group, sessions were conducted in small groups of 3-4 children. In the II-I group, sessions were conducted individually.

Description of the two weekly alphabetic sessions. These sessions encouraged practice of letter knowledge, phonological awareness, and functional writing. All of the study units were preplanned and were introduced within a developmentally appropriate environment, beginning with the familiar and creating a context linking alphabetic knowledge with writing (Wasik, 2001). In line with studies on literacy de-

velopment of hearing children (Levin, Both-de Vries, Aram, & Bus, 2005) as well as deaf children (Williams, 2004), children were first taught to recognize their written name and the written names of their friends. Gradually, they were introduced to word segmentation, syllable retrieval, identification of an opening/closing syllable or phoneme, letter-name and letter-sound correspondence, and writing.

At the beginning of the year, the intervention mainly used the children's names as the written and spoken stimulations. Children played alphabetic games such as clapping hands to accompany segmentation of a name into its syllables; practicing letter-name and letter-sound correspondence by matching the first letter or the last letter of a name to a photograph of a child and then naming the letter (see Appendix); searching for similar letters in children's names.; writing names; and so on. Later in the year, the children participated in more complicated activities like picking an object from a box, saying its name, separating the name into syllables, thinking of other objects that start with the same syllable/phoneme, and so forth. As for writing, the children wrote their names and their peers' names, created words with magnetized letters, switched letters to create new words, made a telephone directory for the preschool, and more. We utilized explicit teaching and practice of the alphabetic skills, with the hope that the clear benefits of such programs for older children (Solity, 1996; Solity & Deavers, 1999) would emerge for the younger children as well. Due to younger children's possible difficulties in writing with a pencil, especially at the beginning of the year, we encouraged the children in the program to be active and practice writing and forming letter shapes in diverse ways: using seals, stickers, magnetized letters, newspaper cuttings, pencils, and crayons.

Description of the one weekly storybook reading session. Each storybook session dealt with various ideas raised by the particular book being used during the session. In the training workshops, we introduced the mediators to 20 children's books recommended by experts on children's literature, and from this selection each mediator chose 10 books that she used in the intervention. Each book served as the basis for three to four successive pre-planned study units. These units enabled repetitive readings of the same book while addressing its main themes and selected vocabulary (Robbins & Ehri, 1994). In each session, mediators read the book aloud twice and discussed central concepts and ideas via games (like cards and matching activities), creative activities (like drawing and clay), and drama activities. They encouraged cognitive processes of induction and deduction, discussed children's assumptions, and connected the story to the children's experience (Whitehurst & Lonigan, 1998). Because story grammar is believed to enhance inference that is required for reading comprehension (Van Kleeck, 2008), mediators were encouraged to refer to the story grammar. They drew the children's attention to the hero of the story, the problem, etc. (see Appendix).

Staff guidance. Intensive mediator training constitutes an important component in early interventions (Lauren & Allen, 1999). Research has shown that interventions that deepen the mediators' expertise in discipline-specific knowledge gain more cooperation from the mediators and last longer (Dickinson & McCabe, 2001). In the

current intervention, the mediators participated throughout the year in monthly 3-hour training workshops held at the MICHA center. Each meeting included a lecture presenting contemporary models of early literacy development and promotion, coupled with a review of studies relevant to literacy development among children with HL. Additionally, each meeting incorporated an exchange of ideas and discussions of implementation problems. In the meeting, the mediators learned the goals and the contents of the coming month's sessions. They received printed one-page guidelines for each session as well as the necessary materials (games, books, stickers). However, they were taught to be sensitive to the children's competencies and to flexibly adapt the activities and their demands from the children to their zone of proximal development (Vygotsky, 1978). For example, the duration of a session was suited to the specific group's attention span, gradually increasing the length of the session throughout the year and never exceeding 30 minutes. The demand for productions also suited the children's capabilities.

Parental involvement. For the parents in the II-I and CO-I groups, the intervention programs enlisted parents' involvement via two lectures and three workshops throughout the year. A university faculty member (the first author) delivered the two lectures on development of early literacy among children with HL and ways for parents to promote early literacy at home. In the CO-I group, the teachers led the three workshops within the preschools, and in the II-I group, the head of MICHA's Tel Aviv branch (the second author) led the workshops at the MICHA center. In these workshops, the groups discussed literacy activities that can be administered at home, and parents shared their experiences related to their children's literacy.

2.3 Alphabetic Skills Assessment Measures

All participants individually completed four tests of early literacy at both the pretest and posttest interval: phonological awareness, letter naming, word writing, and orthographic awareness.

Letter naming. We asked the children to name 12 printed Hebrew letters, each presented on a separate card in large print (200 Times New Roman). Children's responses could be oral or signed, as they preferred. Within the Hebrew alphabet's 22 regular letters and 5 final letters, the 12 regular letters that were chosen for the present study were among the easiest to recognize for children in the 3 to 5 year age range (Levin et al., 2002). Each correctly named letter credited the child with 1 point.

Phonological awareness (Most et al., 2006). This test in Hebrew included 24 stimulus words, each accompanied by three alternatives: two distracter words and one target word that matched the stimulus on initial or final phoneme or syllable, as described below. All the words were presented as illustrations to address children's possible difficulty in managing auditory input. Thus, on each card, we presented the

child with four illustrations: an illustration of the stimulus word in the center and three illustrations below it including an illustration of the target word. Children's responses necessitated only pointing to the correct illustration. For 12 words, we asked the children to refer to the beginning of the words, and for the other 12 words, we asked the children to refer to the final part of the words. For 6 of the 12 words directed at beginnings, we asked the children to match the stimulus word with one of the three words below it that started with the same phonetic sounds (syllable), i.e., *alliteration recognition* [e.g., stimulus word: *kapit* (spoon); target word: *kadur* (ball)]. For the other 6 words directed at beginnings, we asked children to match initial phonemes, i.e., *initial phoneme recognition* [e.g., stimulus word: *tinok* (baby); target word: *tapuach* (apple)]. For 6 of the 12 words directed at endings, we asked the children to match the stimulus word with one of the three words below it that ended with the same phonetic sounds (syllable), i.e., *rhyme recognition* [e.g., stimulus word: *beitsa* (egg); target word: *hultsa* (shirt)]. For the other 6 words directed at endings, we asked children to match final phonemes, i.e., *final phoneme recognition* [e.g., stimulus word: *naal* (shoe); target word: *degel* (flag)]. Each correct response credited each child with 1 point.

Word writing. We asked the children to write six pairs of Hebrew words. The words were presented both orally (and in signs when necessary) and visually. To avoid any misunderstanding caused by a child's HL, we presented each child with six cards (23 x 17 cm.), each of which displayed identifying drawings (9 x 9 cm.) of two nouns (e.g., *pil* - *nɛmala* 'elephant – ant'). With each card, each child received one A4 sized sheet of paper on which to write the pair of words. We scored each written word on a 6-point scale adapted from Levin, Share, and Shatil (1996) and Levin and Bus (2003), consisting of (1) scribble, writing-like schemes (e.g., linearity, segmentation, diverseness), and pseudo letters; (2) random letters; (3) basic consonantal spelling, in which only one letter of the word is written correctly but the other letters are random (e.g., writing the word *nɛmala* 'ant' NMLH using the letter N and other random letters); (4) partial consonantal spelling, in which more that one letter of the word yet not all the letters are written correctly (e.g., writing *nɛmala* with the letters NL and other random letters); (5) advanced spelling with distortions and additions (e.g., writing *nɛmala* with the letters NMCL); and (6) conventional writing. The mean score across the eight words served as the *word writing* score.

Orthographic awareness. We adapted Olson, Kliegl, Davidson, and Foltz's (1985) test to Hebrew. The test included six cards of four graphic items each: one printed word and three non-words that included a mixture of Latin and Hebrew letters, numerals, or illegal repetition of letters. For example, one card comprised the following sequence: ttttt ששש שלום בב. Of these items, only the word שלום [*shalom* (peace/hello)] is a Hebrew word. Children were asked to select the printed word. They could say/sign it and/or point at it. Each correct response credited the child with 1 point.

2.4 Procedure

All children ($N = 79$) were tested at the same two intervals: pretest at the beginning (November) of the school year and posttest at the end of the year (June). Each child individually completed four tests of early literacy within his/her preschool: letter naming, phonological awareness, word writing, and orthographic awareness. Four MA special education students specializing in deaf education assessed the children individually in a quiet room inside the preschool during two sessions (approximately 20 minutes per session). The same teacher/speech therapists administered all the tests for a given child. The tasks were administered in a counterbalanced order.

3. RESULTS

The results comprise three parts: (a) descriptive statistics and intercorrelations for children's alphabetic achievements at the pretest; (b) comparison of children's alphabetic achievements at the pretest across the three groups (II-I, CO-I, and CO-C); and (c) assessment of the intervention's effects (pretest vs. posttest) on children's alphabetic achievements across the three groups.

3.1 Children's Alphabetic Achievements at the Pretest

Table 2 describes the entire sample's ($N = 79$) alphabetic achievements at the pretest, including ranges, means, standard deviations, and reliabilities (Cronbach α) of the measures. The results indicate that the tests were reliable and that the children exhibited sufficient variance in all the literacy measures.

Table 2. Children's Literacy Measures on the Pretest: Ranges, Means, Standard Deviations, and Reliabilities (N = 79)

	Min	*Max*	*M*	*SD*	*Cronbach* α
Variable					
Phonological awareness	0	24	10.83	6.58	.98
Alliteration identification	0	6	3.05	2.05	.78
Initial phoneme identification	0	6	2.50	2.00	.78
Rhyming identification	0	6	2.83	2.14	.81
Final phoneme identification	0	6	2.44	1.86	.71
Letter naming	0	12	5.05	4.51	.95
Word writing	1	6	1.93	1.29	.98
Orthographic awareness	0	6	2.58	1.94	.75

To depict the profile of alphabetic achievements among Israeli preschoolers with HL, we describe the whole sample's achievements ($N = 79$) relative to prior findings for their same-age hearing peers. On letter naming, children with HL identified, on average, 5.05 out of the 12 letters presented to them (41.6%). This score is lower

than the average achieved for the whole alphabet (22 letters) by same-age hearing children studied previously (M = 76%; Levin et al., 2002), especially considering that the children here were presented with the 12 easiest Hebrew letters. On phonological awareness, the mean score of 10.83 for the current children with HL showed that, on average, these children correctly identified 46% of the items. This score is lower than that of same-age hearing children who, on average identified 72% of the items (Most, et al., 2006). A closer look at the children's responses showed that they scored higher when referring to syllables (alliteration or rhyming identification) than to phonemes (initial phoneme or final phoneme identification). On word writing, the mean score of 1.93 reflected the children's frequent use of pseudo and random letters when trying to write a word. This score is lower than that of same-age Israeli hearing children who, on average, used basic consonantal spelling in their writing (Aram & Bialistock, in press). On orthographic awareness, out of the 6 presented items, the children with HL were able to identify, on average, 50% of the real words, whereas same-age hearing children identified an average of 70% (Aram & Levin, 2002). Altogether, these descriptive results suggest that the alphabetic skills of preschoolers with HL are somewhat lower than those of their same-age hearing peers.

Table 3 shows the intercorrelations among alphabetic measures for the whole sample (N = 79) at the pretest interval. The significant correlations across the board (with the exception of the correlation between final phoneme identification and word writing) indicate close relationships among all the assessed alphabetic measures. This interesting finding may suggest that enhancing each of these competencies may advance performance in the others.

Table 3. Correlations among the Early Literacy Measures at the pretest (N = 79)

	AI	I-I	RI	FI	LN	WW
Alliteration identification (AI)	--					
Initial phoneme identification (II)	.58***	---				
Rhyming identification (RI)	.64***	.59***	---			
Final phoneme identification (FI)	.51***	.43***	.52***	---		
Letter naming (LN)	.33**	.58***	.45***	.26*	---	
Word writing (WW)	.26*	.36***	.26*	.08	.50***	---
Orthographic awareness (OA)	.43***	.39***	.43***	.32**	.57***	.31**

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

3.2 Comparing the Three Groups' Literacy Skills at the Pretest

The left side of Table 4 presents the groups' scores on each of the alphabetic measures at the pretest. To compare the three groups' alphabetic achievements at the pretest (II-I, CO-I, and CO-C), we conducted a series of one-way analyses of variance (ANOVAs).

Table 4. Comparing growth in literacy measures across time and groups (N = 79): Means (SD) and F-values (Two-Way ANOVAs).
Groups: A (Co-enrollment-comparison), B (Co-enrollment-intervention), C (Individual inclusion-intervention)

	Child's literacy measures							
	Pretest M (SD)			*Posttest M (SD)*				
Variables	Group A (*N* = 23)	Group B (*N* = 33)	Group C (*N* = 23)	Group A (*N* = 23)	Group B (N = *33)*	Group C (*N* = 23)	*F* time	*F* time*group
Alliteration identification	2.87 (2.00)	2.15 (1.76)	4.47 (1.72)	2.97 (2.18)	3.53 (1.99)	4.80 (1.83)	8.21**	3.13*
Initial phoneme identification	2.12 (1.91)	1.90 (1.87)	3.69 (1.81)	2.20 (2.23)	2.87 (1.71)	4.71 (1.97)	8.69**	1.67
Rhyming identification	2.74 (2.15)	2.25 (1.95)	3.73 (2.17)	3.37 (2.17)	4.15 (1.43)	5.23 (1.60)	29.91***	2.48^
Final phoneme identification	1.90 (1.66)	2.31 (1.82)	3.13 (1.98)	2.52 (2.50)	3.03 (1.85)	4.80 (1.80)	13.86***	1.75
Letter naming	5.28 (4.59)	4.28 (4.57)	6.00 (4.37)	8.35 (4.21)	7.57 (4.68)	9.57 (3.62)	53.34***	0.91
Word writing	2.27 (1.65)	1.52 (0.71)	2.20 (1.42)	2.50 (1.78)	2.28 (1.19)	3.60 (1.71)	21.38***	3.94*
Orthographic awareness	2.85 (1.68)	2.21 (1.89)	2.86 (2.22)	3.50 (2.21)	2.72 (1.95)	3.86 (2.09)	8.69***	0.33

*$p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ^ $p < 0.07$

The one-way ANOVAs for the four phonological awareness measures all revealed similar results. Significant differences emerged among the three groups on alliteration identification, F (2, 76) = 10.98, $p < .001$; initial phoneme identification, F (2, 76) = 6.75; $p < .01$; rhyming identification, F (2, 76) = 3.34, $p < .05$; and final phoneme identification, F (2, 76) = 2.64, $p < .08$. Bonferoni tests conducted to reveal the source of the differences showed similar results for all four phonological awareness measures: In line with our first hypothesis, the II-I group significantly outperformed the two co-enrollment groups on phonological awareness, but no significant differences emerged between the two co-enrollment groups.

A one-way ANOVA for letter naming did not reveal significant differences among the three groups, F (2, 76) = 0.99, $p > .05$. A one-way ANOVA for word writing exhibited marginal significant differences among the three groups, F (2, 76) = 3.12, $p = .05$, but a Bonferoni test conducted to reveal the source of the differences did not find significant differences among the three groups (II-I, CO-I, and CO-C). Likewise, no significant differences emerged among the groups on orthographic awareness, F (2, 76) = 1.05, $p > .05$.

3.3 Assessing the Intervention's Effects

To determine the effects of the intervention on the children's alphabetic skills, we compared the children's progress on each of the alphabetic measures from pretest (November) to posttest (June) across the three groups (II-I, CO-I, and CO-C). For each of the alphabetic measures, we conducted the following two-way ANOVAs: 2 (Time: pretest/posttest) X 3 (Group: II-I/CO-I/CO-C). Table 4 presents the children's achievements on each of these measures at the pretest and the posttest across the three groups. It also presents the main effects of time and their interactions with group.

The significant main effects of time show that the children in all three groups progressed from the pretest at the beginning of the year (November) to the posttest at the end of the year (June) in all the assessed measures. Yet, confirming our second hypothesis, the two intervention groups progressed more than the comparison group. Significant interactions emerged between time and group for alliteration identification and word writing, and marginally for rhyming identification. A post-hoc Bonferroni test revealed the source of these interactions: On these three measures, only the two intervention groups (II-I and CO-I) progressed significantly from pretest to posttest. The gain made by these groups surpassed that of the comparison group.

In contrast with our third hypothesis, no significant differences emerged between the two intervention groups (II-I and CO-I) regarding the extent of children's progress.

4. DISCUSSION

This study depicted an 8-month intervention focusing on preplanned, systematic alphabetic skills and storybook reading activities and assessed its efficacy in promoting alphabetic skills of children with HL in individual inclusion and coenrollment preschool settings. We compared the progress of children with HL who participated in the intervention to that of a group of children with HL who did not. We also compared the progress made by the children in the two different inclusion tracks who participated in the intervention (II-I and CO-I).

Results indicated that the intervention significantly promoted children's alliteration and rhyming identification as well as their word writing. On these measures, children who participated in the intervention (II-I and CO-I) progressed more than the children in the control group (CO-C) regardless of their inclusion track. Interestingly, despite the fact that the children in the II-I group outperformed the children in the CO-I group on phonological awareness at the pretest, the two intervention groups (II-I and CO-I) did not differ in their progress from November to June.

The description of the whole sample's ($N = 79$) alphabetic skills at the pretest revealed diversity and yet a generally low profile. These results are in line with previous studies showing that the alphabetic skills of children with HL lag behind those of hearing children and may develop in different ways (e.g., Andrews & Gonzales, 1992; Nielsen & Luetke-Stahlman, 2002; Spencer & Tomblin, 2009; Sterne & Goswami, 2000). However, the current sample's relatively low profile may also stem from the tendency of children with HL to learn less spontaneously and more from direct teaching (e.g., Akamatsu & Andrews, 1993; Nielsen & Luetke-Stahlman, 2002). Parents at home as well as educators in the preschools and in the MICHA centers focus their attention on direct teaching of language (vocabulary, grammar, syntax, speech intelligibility) and pay less notice to the development of the children's alphabetic skills. Educators may emphasize language skills more than alphabetic skills, believing that they are secondary and will be easy to acquire once the children's language is sufficiently developed (e.g., Dyson, 2001). Perhaps educators assume that one cannot attain alphabetic skills without age-appropriate language (e.g., Giogia, 2001; Gillespie & Twardosz, 1997). Furthermore, alphabetic skills are

often assumed to be overly difficult for children with HL (e.g., Portugez, 2003). Therefore, some researchers think that these skills can be "skipped" when trying to promote these children's early literacy; however, others uphold the need to promote them so that children will develop an adequate level of reading (for review and discussion, see Mayer, 2007).

At the pretest, children in the individual inclusion track showed an advantage over their peers in the co-enrollment track in all the phonological awareness measures but not in the other alphabetic measures. These differences could be reasonably expected because, in general, children in the individual inclusion track demonstrate a higher language level. As explained above, to meet the criteria for individual inclusion, their language achievements must be age-appropriate and cannot lag more than one year behind their hearing peers.

Above and beyond these differences at the pretest, the study showed that a systematic, pre-planned intervention can significantly promote the alphabetic skills of children with HL. As in previous studies with hearing children (Aram, 2006; Aram & Biron, 2004), the current results indicate that the intervention was fruitful in enhancing the basic skills immanent to the acquisition of reading and writing of children with HL. Children who participated in the program progressed on these skills more than their peers who did not participate in the program.

The success of the current intervention in specifically promoting these children's phonological awareness is encouraging. Many researchers agree that intensive, systematic reading instruction is necessary for young children with HL due to the complexity of their acquisition process for phonological skills (e.g., Nielsen & Luetke-Stahlman, 2002, Portugez, 2003). The impact of the current intervention at the syllable rather than the phoneme level corresponds with children's developmental acquisition of alliteration and rhyming earlier than phoneme awareness (Goswami & Bryant, 1990). Advancement of these skills to a higher level probably requires more intensive direct training.

The high positive correlations among the alphabetic measures assessed in the study supports the implementation of programs focusing on alphabetic activities like the one described here. These correlations may imply that alphabetic skills are tightly interwoven and that promoting one skill may help in promoting others. This may especially hold true for early writing, an activity that incorporates phonological awareness, letter knowledge, and orthographic awareness. Early writing represents understanding of the alphabetic principle and strongly predicts later progress in decoding (for discussion, see Whitehurst & Lonigan, 2001). Hence, the results of the present study demonstrate the fruitfulness of writing activities with young children with HL.

Yet, the comparison of the two intervention groups' progress pointed out that children in the II-I group, who showed higher language abilities at the pretest, did not progress more than those in the CO-I group, who started out with poorer language skills. A basic premise in early literacy upholds a close connection between language acquisition and subsequent literacy development, meaning that children with well-built language abilities find it relatively easy to make the move to text-based literacy (Beck & Olah, 2001). The results of the present study help us argue

that language proficiency comprises a fundamental—but not sole—condition for early literacy development.

Children need early literacy learning opportunities in relevant, purposeful, and functional ways that suit them (Mayer, 2007). Perhaps children placed in the individual inclusion track do not have adequate opportunities to practice their alphabetic skills. One can presume that the children in the II-I group were challenged by the need to address literacy-learning situations in their preschool. These activities were probably not always mediated with optimal conditions (e.g., making the input accessible via amplification or visual accessories, face to face communication or speech reading, and structured learning situations). Along the same lines, children in the CO-I group engaged in well-established acoustic environmental situations, in which input through amplification was accessible, learning was mediated with visual components, and the education program was tailored to the children's needs. Thus, although the children in the II-I group exhibited better alphabetic skills at the start and also experienced the intervention sessions individually with the mediator, they did not progress more than the children in the CO-I group. A feasible explanation for this finding may be that during regular preschool activities, the children in the II-I group were exposed to learning situations that promoted engagement in literacy activities, but these situations did not optimally mediate the activities for the children with HL.

To sum up, evidence suggests that children who start school behind their counterparts on alphabetic skills are likely to stay behind (Whitehurst & Lonigan, 2002). The present study's outcomes draw attention to issues other than language in the literacy education of children with HL. We showed that a program incorporating alphabetic skill activities in the regular curriculum via games and activities that relate to children's lives may effectively promote alphabetic skills of children with HL and may have an impact on the trajectory of their school success.

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APPENDIX

EXAMPLES OF MEDIATOR GUIDELINES FOR STORYBOOK READING AND ALPHABETIC SESSIONS

Note that the mediators in the II-I and the CO-I groups followed the same guidelines but adapted them to individual (II-I) or small group (CO-I) sessions.

STORYBOOK READING SESSION: "A CAT ON THE MAT", BRIAN WILDSMITH

Session 1 out of 4 devoted to this book

1) Show the children the book cover and ask them about the subject of the book: Who will the hero of the book be? How do we know? Where is the author's name written? Where do we see the book's title?
2) Read the book title and ask the children to predict the story: "Now what do you think? What will this book be about?"
3) Read the story aloud, showing the pictures.
4) Play a game with the children practicing the book's themes of crowdedness and spaciousness. To the sound and sight of a gong, ask the children to stand very close to each other; then, to the sight and sound of the gong, ask the children to spread out around the room.
5) Give each child a red paper (the "mat") and pictures of the book's animal characters. Read the story with the children and ask the children to place the animals on the mat as they join the story. The children will paste the animals onto the paper, and the teacher will hang their products on the wall.

ALPHABETIC SKILLS: "ME AND MY NAME"

1) Spread photographs and printed names of the children in the group on the table. For each printed name, add a card presenting its first letter. Ask each child to select his/her picture and printed name.
2) Tell the children: "I want to give you the first letter of your name. Can you help me by telling me which of these letters I should give you? What sound does it make in your name?" If a child does not know the name of the target letter, ask him/her to point it out on the alphabet board or on the card presenting their full printed name. If he/she cannot, then show him/her the letter, name it, and say: "This is the letter M; it makes the sound MMMM in your name Maria."
3) As you give each child the first letter of his/her name, say clearly and loudly, for example: "Here is M; it is the first letter in the name Maria."
4) Ask the children to find a few stickers that show the initial letter of their first name, from among many letter stickers that are spread on the table in different

sizes and colors. Instruct the children to stick several stickers showing the initial letter of their first name on the card presenting their printed name.

5) The session ends with a goodbye ritual. Each child says: his/her name, the first syllable and/or phoneme of the name, the first letter of the name, and goodbye (e.g., "My name is Maria. My name starts with 'MA,' with the letter M, goodbye").

BIOGRAPHICAL NOTE

Dr. Dorit Aram is an Associate Professor and head of the Special Education Program in Tel Aviv University's School of Education. Her research focuses on parent-child literacy interactions and their implications for early literacy and socio-emotional development, in communities with and without special needs.

Dr. Sara Ingber has filled a broad range of leading positions in the field of deaf education in Israel. She is the educational director of the preschool multidisciplinary centre for deaf children in Israel (MICHA), she holds a lecturer position in the school of education in the Tel-Aviv University and is involved in research and development of preschool deaf education programs conducted by the Ministry of Education in Israel.

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