Critical Review:
What factors impact literacy development in individuals with severe speech and physical impairments (SSPI) who are using augmentative or alternative communication (AAC) systems?

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This critical review examined the factors that impact literacy development in individuals with severe speech and physical impairments (SSPI) who are using augmentative or alternative communication (AAC) systems. Study designs reviewed included: case control study (1), qualitative research studies (3), and survey research (2). Overall, the studies demonstrated strong validity and a general reliability was established based on the pattern of similar results. The studies identified factors which promoted, hindered, or did not affect literacy development in individuals with SSPI.

Introduction

Literacy development is a vital process in an individual's life and begins almost as soon as an infant is exposed to oral language. As children grow, their exposure to both oral and written language increases and emergent literacy skills, such as print awareness, book awareness, story sense, phonological awareness, matching speech to print, and practicing prereading and prewriting skills, begin to develop. All of these skills, but most specifically phonological awareness, have been found to be highly predictive of literacy development in typically developing children (Paul, 2001). However, it is unclear what factors impact literacy development in children with severe speech and physical impairments (SSPI). Children who do not develop adequate literacy skills may be at risk for the "Matthew Effect" which is when a child's early achievement encourages faster rates of subsequent achievement and early failures spawn a spiraling deficit effect in development (Stanovich, 1986). A child who does not acquire literacy skills will continue to fall further behind her peers in social, academic, and cognitive development (Larson & McKinley, 2003).

Literacy is defined as "the ability to read and write in a desired language. It includes having knowledge about the use of reading and writing in everyday life. Literacy requires active and independent engagement with print and includes both sending and receiving orthographic messages." (Harris & Hodges, 1995 as cited in Beukelman & Miranda, 2005, p. 351). Many children who use augmentative or alternative communication (AAC) systems are at risk for not developing functional literacy skills (Kelford, Smith, Thurston, Light, Parnes, & O'Keefe, 1989; Koppenhaver & Yoder, 1990; McNaughton & Tawney, unpublished manuscript, as cited in Light & McNaughton, 1993). The ability to read and write is necessary in order to participate in many everyday activities. The World Health Organization's International Classification of Functioning Disability and Health (ICF) (2001) provides a framework to organize information regarding human functioning and disability. The development of literacy skills enables individuals who have SSPI to reduce activity limitations and participation restrictions. It provides opportunities for successful participation in a variety of environments such as home, work, school, and social settings, as well as access to a range of sophisticated AAC systems, which can increase communication skills (Beukelman & Mirenda, 2005).

For the purpose of this review, the term severe speech and physical impairments (SSPI) refers to individuals with "a severe speech problem that is due primarily to physical, neuromuscular, cognitive, or emotional deficits and not to hearing impairment, and who cannot, at the present time, use speech independently as their primary means of communication…[and who have] congenital or acquired motor impairment[s] which may also impair speech, nonverbal communication, and writing as a result of problems with muscles tone, posture, and involuntary movements." (Koppenhaver and Yoder, 1992, as cited in Koppenhaver, Hendriz, & Williams, 2007, p. 157)

Objectives

The primary objective of this paper is to critically evaluate existing literature regarding the factors that impact literacy development in individuals with SSPI who are using AAC systems. The secondary objective is to propose evidence-based practice recommendations regarding improving literacy development in children with SSPI who use AAC systems.

Methods

Search Strategy

Computerized databases, including PsychInfo and Proquest, were searched using the following search strategy:

((alternative communication) OR (augmentative communication) OR (Severe Speech and Physical Impairment) OR (AAC) AND ((reading development) OR (literacy development)) AND ((cerebral palsy) OR (CP))

The search was limited to articles published in English between 1990 and 2007. This strategy was generally unsuccessful. However, reference lists of articles identified through the databased strategy were searched for further relevant publications. As well, a review of relevant peer reviewed journal indexes and a reference list from a presentation given by an expert in the field lead to more relevant resources.

Selection Criteria

Studies selected for inclusion in this critical review paper were required to have investigated factors impacting literacy development in individuals with SSPI who use AAC systems. No limits were set on the demographics of research participants, study designs, or outcome measures.

Data Collection

Results of the literature search yielded both quantitative and qualitative studies matching the aforementioned chosen selection criteria: case control study (1), qualitative research studies (3), and survey research (2).

Results

Case Control Study:

Sandberg & Hjelmquist (1996) examined phonological abilities and literacy competence in a small group of nonspeaking Swedish preschoolers. In this case control study, eight nonspeaking preschoolers had a diagnosis of cerebral palsy (CP), had no intelligible speech, were Bliss users, and were recruited from all over Sweden. The control group included eight nondisabled children recruited from local preschools. The groups were matched for sex, chronological age, and intelligence level. The researchers evaluated phonological awareness, letter knowledge, spelling ability, reading ability and verbal comprehension. Results were analyzed using analysis of variance (ANOVA) and the Tukey method for post hoc tests. The authors reported no significant differences between the groups on any of the indicators of phonological awareness and letter knowledge. However, a statistically significant difference was noted between groups for spelling tasks, reading abilities, and verbal comprehension where the control group performed better than the disability group. The authors concluded that while the children in the disability group performed equally as well as the control group in phonological skills, the children in the disability group performed far lower on the reading and spelling tasks than the control group. The children in the disability group, unlike the control group, were unable to use their skills in phonological awareness skills to improve their performance on the spelling and reading tasks, suggesting that even a relatively high level of phonological skill is not sufficient for the development of literacy skills among nonspeaking children.

The authors did not include how the participants were recruited for the study; however, attempts were made to use a homogenous group as the selection criteria was very exclusive. All of the measurement tools used to assess the participants were objective and previously validated, however, one test method was slightly modified to accommodate for the nonspeaking participants. The results were analysed using appropriate statistical measurements but the authors did not account for any potential confounding factors in the design. The task performance on certain tests may have been influenced by priming effects resulting from the labeling of pictures immediately preceding testing trials. It should be noted that the study was completed in Swedish and it may not be appropriate to generalize the results to English users.

Survey Research:

Kopenhaver, Evans, & Yoder (1991) studied the childhood reading and writing experiences and shared personal characteristics of 22 literate adults with SSPI. The authors conducted a retrospective survey that examined school context, home context, and attributions of successful literacy learning. The survey included Likert scale type questions, multiple choice questions, and open-ended questions and was conducted by face-to-face interviews using a standard protocol. Descriptive statistics were compiled for the Likert scale type and multiple choice questions and the open-ended questions were categorized and tabulated into subcategories. The authors reported that the individuals grew up in home and school environments that were rich in reading and writing materials and that they were immersed in varied and regular experiences with print materials.

Light & Smith (1993) conducted a survey comparing the home literacy experiences of fifteen physically disabled preschoolers who use AAC systems to the experiences of fifteen of their non-disabled peers. Specifically, the authors examined the physical and functional, language, and cultural contexts. The questionnaire consisted of multiple choice questions, rank order questions, and open-ended questions. Analysis of the data included a combination

of descriptive statistics, the Chi Square Test for Independence, and a recognized method of qualitative analysis. The authors reported that in general there was no significant difference between the reading and writing environments between groups. However, it was reported that the children in the AAC group, compared to their non-disabled peers, had less opportunity to use printed materials or to participate in writing/drawing activities and during story reading activities they seemed to be less involved in initiating and asking questions about the text. As well, there was a difference in parental priorities for their child's development. The parents in the AAC group identified reading and writing as a low priority for their children, whereas the parents of the nondisabled group selected reading and writing as a high priority for their children.

Overall, survey research is an indirect and less compelling approach used to gather information; therefore the information obtained must be interpreted with caution. Due to the nature of the population studied, it was not possible for either by Kopenhaver, Evans, & Yoder (1991) or Light & Smith (1993) to employ random sampling of their participants. The Kopenhaver, Evans, & Yoder (1991) study used a modification of the snowball technique to recruit, where they contacted professionals involved with AAC users who then recruited appropriate AAC users for the study. The Light & Smith (1993) study employed the less desired opportunist technique where they selected the AAC group from the caseload of a children's treatment centre. However, both studies submitted drafts of the questionnaire to professionals in the field as well as to the targeted population and the questionnaires had acceptable response rates (62%-75%). Both studies also used accepted methods of data collection for both qualitative and quantitative data and demonstrated good interrater reliability rates. A strength of the Light & Smith (1993) study is that a control group was included in their survey which allowed statistical measures of significance to be determined. The Kopenhaver, Evans, & Yoder (1991) study could only report descriptive statistics such as means and modes. A strength of the Kopenhaver, Evans, & Yoder (1991) study is that possible limitations were noted, such as the reliability of the data as it came from introspection over a long period, the relevancy the experiences of these individuals due to social changes and advances in technology, and the interpretations of the data based on research with the nondisabled population. The Kelford & Smith (1993) study did not directly list any limitations.

Qualitative Research Studies:

Mike (1995) conducted an ethnographic study of one classroom at a school for children with cerebral palsy. The purpose of the study was to describe and explain the factors that impact on literacy learning within the classroom. The classroom contained five students who were severely multiply disabled, and included physical, visual, speech, hearing, and perceptual impairments. Data collection included nonparticipant observation, interviews with teachers and administrators, videotape analysis, and an examination of student records. The author analyzed video transcripts, interviews and field notes, and coded literacy events. Several factors were identified that promoted literacy development in the classroom: the room as a text-rich environment, the latitude often given to students to determine their own literate behaviour, regularly conducted story reading sessions, and the constructive use of computers. Other factors were determined to inhibited literacy development in the classroom: restriction of instruction time, overreliance on individual instruction, and lack of student literate interaction

Zascavage & Keefe (2007) examined barriers to literacy for individuals with SSPI through 20 semi-structured interviews of parents, teachers, university faculty, and administrators involved in literacy education of these students. Four questions were used as a foundation for responses and the interviews were transcribed and coded. The data was examined through five different models of disability: medical, materialist, administrative, social barriers, and no construct. A thematic analysis was conducted using the constant comparison method, re-examinations of dialogue for trends and thematic variation as well as evaluating possible outliers and emerging themes. Investigator triangulation as well as data triangulation were noted. Four constructs were identified that influenced educational opportunity to various degrees. The authors reported that the materialistic and medical models dominated discussion of education practices (e.g., functional/life-skill curriculum) and attitudes (e.g., lowering of academic expectations for traditional literacy achievement); the administrative model was predominant in areas of policy (e.g., financial allocations in the areas of teacher training, assistive technology, and classroom materials); and the social barriers model focused on technology access and teacher preparation (e.g., scheduling for literacy instruction).

Smith (1992) examined the performance of two nonspeaking children with cerebral palsy in the areas of receptive language, expressive language, visual perceptual abilities, and auditory perceptual abilities, whose reading abilities were within the average range on the SPAR Group Reading Test. Measurement tools included the Test of Auditory Comprehension of Language (TACL), the British Picture Vocabulary Scales (BPVS), the Carrow Auditory Visual Abilities Test (CAVAT), informal expressive language tasks, and a teacher and parent questionnaire. Results indicated that both children scored within normal limits on the TACL, and one

child was marginally outside the normal limits for the BPVS. On the CAVAT, both children scored significantly below the average range. For the informal language tasks, both children were able to complete the tasks but their language was not syntactically correct and they required additional time to complete the tasks. The author identified possible factors which may have contributed to their literacy success. Both children had relatively good hand abilities and one child's speech was intelligible enough for functional communication. Neither child presented with any auditory or visual acuity problems nor perceptually based reading difficulties and both children had typical receptive language abilities. It was also reported that both children enjoyed reading and had a high level of motivation to achieve in this area. Both children utilized AAC systems using printed words, came from homes where reading was valued and positively reinforced, their parents visited libraries and bought books for leisure reading, and their parents reported that reading was their favourite leisure activity

The value of qualitative research is often debated; however, it has become increasingly acceptable to use qualitative research within the evidence based practice movement. Properly conducted qualitative research can provide insight into events or populations that are difficult to study using quantitative research (Greenhalgh, 2006). The studies by Mike (1995) and Zascavage & Keefe (2007) are good examples of high quality qualitative research as they had numerous methodological strengths. The Zascavage & Keefe (2007) interview study used a snowballing method to select participants and sought diverse demographics to reduce bias. A variety of participants were included to establish triangulation of results and the in-depth interviews were limited to 20 participants based on literature recommendations. The interviews were conducted until the participants felt the topics were saturated and the transcripts were analyzed using a thematic analysis and then coded using the constant comparison method. Results were also compared to current research in the field and a negative case analysis was used to scrutinize any discrepancies. The ethnographic study completed by Mike (1995) had a small sample size (n=5), however was selected because it was viewed as a classroom where literacy was well promoted. A variety of measures were used to obtain data which allowed for triangulation of the results. The author also acknowledged possible reflexivity. The length of the study or how the saturation of data was determined was not detailed. Zascavage & Keefe (2007) and Mike (1995) have demonstrated considerable validity in their results, but only fair reliability, as both studies did not use blinding during the analysis of data which would have reduced potential researcher bias.

The conclusions of the qualitative case study conducted by Smith (1992) should be interpreted with caution. The study included only two participants, thus limiting generalization to the population of children with SSPI who use AAC systems at large. The two participants were described in detail and their skills in the specific tasks were assessed using a combination of objective and subjective measures. However, the objective measures were not normed using physically disabled children and therefore must be interpreted with caution. The authors also did not discuss the reliability and validity of the subjective measures. As well, some information reported was based on parent and teacher recollections which may affect the accuracy of the information.

Conclusions

The current evidence available to speech-language pathologists who are concerned about low literacy development in individuals with severe speech impairments is limited to a small body of research that includes case control studies or descriptive types of studies, such as survey and qualitative research. The studies reviewed used designs that are considered to be a low level of evidence according to Dollaghan (2007); however, overall the quality of the studies was high. The studies used appropriate designs considering the heterogeneity of the population studied and the multitude of environmental factors that can affect literacy development. While individually the studies do not provide strong evidence regarding the factors that impact literacy development, when combined the studies share similar conclusions. The replication of the results leads to an increased overall reliability of the evidence.

The current research demonstrates that many intrinsic and extrinsic factors are involved in the development of literacy skills in individuals with SSPI. The studies included in this critical review identified factors which are believed to have supported, hindered, or had no effect on literacy development in individuals with SSPI. The factors were identified based on research of language and literacy development in nondisabled children.

Factors such as home and school environments that were rich in reading and writing materials, being immersed in varied and regular experiences with print materials, autonomy of literate behaviour, regularly conducted story reading sessions, and the constructive use of computers promoted literacy development. On the other hand, it was determined that literacy development was hindered by the restriction of instruction time, overreliance on individual instruction, a lack of student literate interaction, and a reduced number of opportunities to use printed materials or to participate in

writing/drawing activities. Furthermore, low parental expectations and priorities for literacy development, a focus on functional/life-skill curriculum, minimal financial allocations for teacher training, assistive technology, and classroom materials, and finally, the scheduling of literacy instruction were also believed to be inhibiting factors. Surprisingly, the development of phonological awareness skills was determined to be a factor which had no effect on the development of literacy skills in individuals with SSPI. Thus, it can be concluded that phonological awareness skills were not sufficient for developing literacy skills and are not good predictors of future literacy ability in individuals with SSPI.

Recommendations

Further research is needed to clarify and confirm the research that has already been completed. Future research should include high quality qualitative research, as it would provide a broader understanding of the factors which impact literacy development in this dynamic population. When feasible, specific factors (e.g., phonological awareness skills) should be identified and studied using quality quantitative research to determine their impact on literacy development.

Speech-language pathologists (SLP) should continue to advocate for literacy instruction for individuals with SSPI and encourage caregivers and educators to utilize a variety of literacy activities to help further develop literacy skills. It is important for clinicians to recognize that the factors that impact literacy development in non disabled children may differ from the factors impacting literacy development in individuals with SSPI, making it essential for future researchers to familiarize themselves with current research on literacy development specific to individuals with SSPI. In order to further add to the limited body of knowledge in this field, it would be helpful if SLPs could record their clinical observations, and compile informal research of literacy development in individuals with SSPI. At this stage in the research, even simple observations by professionals could provide valuable insight into the factors which impact literacy development.

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