



Short- and long-term outcomes for children with speech sound disorders

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Introduction

The most common types of speech or language problems reported in children are speech sound disorders (SSDs). SSDs include both errors of articulation or phonetic structure (errors due to poor motor abilities associated with the production of speech-sounds) and phonological errors (errors in applying linguistic rules to combine sounds to form words). SSDs are highly prevalent in preschool children, approximately 16% of children at 3 years of age (Campbell, Dollaghan, & Rockette, 2003) with an estimated 3.8% of children continuing to present with speech delay at 6 years of age (Shriberg, Tomblin, & McSweeney, 1999). More than half of these children encounter later academic difficulties in language, reading, and spelling (Lewis, Freebairn, & Taylor, 2000; Bishop & Adams, 1990; Lewis, Ekelman, & Aram, 1989; Flax, Realpe-Bonilla, Hirsch, Brzustowicz, Bartlett, & Tallal, 2003; Aram & Hall, 1990) and often require other types of remedial services, with 50-70% exhibiting general academic difficulty through grade 12 (Gierut, 1998).

The residual effects of an early childhood speech sound disorder (SSD) may be life-long. Adults with a history of SSDs continue to perform more poorly than adults without a history of SSDs on measures of articulation, and receptive and expressive language (Felsenfeld, Broen, & McGue, 1994; Lewis, Freebairn, Hansen, Miscimarra, Iyengar, & Taylor, 2007). Further, adults with a history of SSDs reported that they required more remedial services throughout their academic careers and completed fewer years of formal education than adults without earlier SSDs. The importance of communication and information skills and technologies in the work place will continue to increase in the future; and the individual who has a communication disorder will thus be at a disadvantage in this regard. An individual's future occupational success can be improved greatly through the early identification of communication disorders, establishment of their causes, and subsequent intervention (Van & Holte, 2003).

Key Research Questions

1. What are school-age outcomes (short-term) of individuals with early childhood SSDs?
 - a. How do children with SSDs and co-morbid language impairment (LI) differ in outcomes from children with isolated SSDs?
 - b. How do outcomes of children with persistent SSDs differ from children who have recovered at school age?

2. What are adult outcomes (long-term) of individuals with early childhood SSDs?
 - a. Do adults with histories of early childhood SSDs differ from adults without a history of SSDs on speech, language, reading and spelling measures?
 - b. What long-term impact does an early SSD have on adult educational, occupational and social outcomes?

Recent Research Results

1. *What are school-age outcomes (short-term) of individuals with early childhood SSDs?*

Studies that have followed children with early childhood SSDs to school age have found later academic difficulties in 50-75% of their samples (Bishop & Adams, 1990; Aram & Hall, 1989; King, Jones, & Laskey, 1982; Lewis, Ekelman, & Aram, 1989). A follow-up study of young children with these disorders revealed that 18% of participants with an isolated SSD had reading problems in mid-elementary school, compared with 75% of those with combined SSD and LI (Lewis, Freebairn, & Taylor, 2000). Linguistic deficits and reading and spelling problems persist for even longer periods for some children (Van & Holte, 2003; Bishop, Price, Dale, & Plomin, 2003; Lewis, O'Donnell, Freebairn, & Taylor, 1998; Wiener, 1974; Young, Beitchman, Johnson, Douglas, Atkinson, Escobar, & Wilson, 2002).

Several studies have suggested that children with persistent SSDs may have different outcomes than children whose problems resolve by school age (Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998). Children whose problems had not resolved by 5 ½ years performed less well on tests of phonological processing and literacy skills. Further, evidence for differences in etiology between persistent and non-persistent SSDs is provided by Bishop et al. (2003) who showed that heritability of LI was higher for children with persistent LI than for those with language delays that normalized during early childhood. However, Bishop et al. (2003) did not examine persistent SSDs independent of LI.

Several studies have suggested that children with SSDs and LI are at risk for behavioral and social difficulties at school-age and early adolescence (Botting & Conti-Ramsden, 2000; Conti-Ramsden & Botting, 2004; Cantwell & Baker, 1987; Fujiki, Brinton, & Todd, 1996; Redmond & Rice, 1998). Problems with social relationships and other behavioral difficulties may persist after the speech and language difficulties have supposedly resolved (Clegg, Hollis, & Rutter, 1999; Rutter & Mawhood, 1991).

2. *What are adult outcomes (long-term) of individuals with early childhood SSD?*

Few studies have examined adult outcomes of early childhood SSD. In a recent workshop on the epidemiology of communication disorders, the National Institute on Deafness and other Communication Disorders (NIDCD) identified a lifespan perspective of communication disorders as a priority for research including educational achievement, occupational performance, social participation and quality of life (NIDCD, March 29-30, 2005). In early adulthood the individual experiences transitions to new activities and social roles. Data is needed on the association of early communication disorders to problems and difficulties with this transition.

In one of the few studies of adult outcomes of childhood speech-language impairments (Young, Beitchman, Johnson, Douglas, Atkinson, Escobar, & Wilson, 2002) participants with LI performed significantly lower than control subjects on all areas of academic achievement, including literacy and mathematics. Further, higher rates of learning disabilities were observed in the LI group than in the SSD or control groups. Despite the more pervasive deficits of the LI group, participants with histories of SSDs scored lower than controls in real word decoding indicating that individuals with SSDs alone have some long-term deficits. In another follow-up study of adolescents (Leitao & Fletcher, 2004) children whose speech errors were characterized by nondevelopmental error processes had weaknesses in phonological awareness, reading, and spelling. Another study confirmed that individuals with an isolated SSD scored poorer on spelling measures relative to their other academic skills (Lewis, Freebairn & Taylor, 2000).

The residual effects of early SSDs in adulthood were examined by Felsenfeld, Broen, and McGue (1992) who followed 24 adults with a history of SSDs and 24 adults without a history of SSDs who, as children, participated in the Templin Longitudinal Study designed to collect normative data on articulation skills. Results showed that adults with a history of SSDs performed more poorly than adults without a history of SSDs on measures of articulation, and receptive and expressive language. Further, adults with a history of SSDs reported that they required more remedial services throughout their academic careers and completed fewer years of formal education than adults without earlier SSDs. The groups did not differ in nonverbal reasoning skills, employment status (i.e. full, part-time or unemployed) or job satisfaction (Felsenfeld, Broen, & McGue, 1994; Felsenfeld, Broen, & McGue, 1992). However, the groups differed on their occupational classification based on the Hollingshead Four Factor Index of Social Class (Hollingshead, 1975). Specifically, the adults with a history of SSDs occupied jobs requiring fewer skills than the adults without histories of SSD. Such long-term educational, social, and economic consequences for the affected individual may result from residual difficulties in reading and spelling that persist into adulthood. However, written language skills were not assessed in the Felsenfeld study. A study conducted by Lewis et al. (2007) confirmed that parents with a history of SSDs had poorer outcomes than parents without a history. Another recent adult follow-up of 17 men in their mid 30s with a history of a severe language disorder in childhood revealed persistent deficits in theory of mind, verbal short-term memory, and phonological processing; together with social difficulties and an increased risk of psychiatric disorders (Clegg, Hollis, Mawhood, & Rutter, 2005). However, this study did not classify the participants according to the presence or absence of a history of SSDs.

Directions for future research

Few studies considered SSDs apart from LI and most studies did not follow participants into adulthood nor did they assess the functional significance of early SSDs at adulthood. Studies did not assess multiple symptom dimensions at each time point. Finally, no study to date has examined outcomes based on genetic influences and thus, the groups examined mostly likely were heterogeneous in their etiology.

Well-designed longitudinal prospective studies with an appropriate matched control group are needed to assess the functional significance of early SSDs at school age,

adolescence and adulthood. Examination of outcomes should consider subgroups of SSDs and co-morbid conditions such as dyslexia, language impairment, and ADHD. Research is needed to identify genetic and environmental prognostic indicators. New technologies such as functional magnetic resonance imaging may identify differences in neuropsychological process related to speech sound production. Finally, studies are needed to determine which intervention strategies are most effective and yield the optimal outcome for individuals with early childhood SSDs.

Conclusions

SSDs are highly prevalent in early childhood and yet little is known about the short and long-term impact that SSDs have on educational, social, behavioral, and occupational outcomes. There is evidence to suggest that some subtypes of SSDs have better outcomes than other subtypes (i.e. an isolated SSD vs. a combined SSD and LI; persistent vs. recovered SSD). These subtypes may differ in their underlying genetic, cognitive, and neuropsychological etiologies. Adult studies suggest that the residual effects of an early SSD may be lifelong impacting educational achievement, occupation, and ultimately socio-economic status. Research is needed to better delineate the short- and long-term outcomes of early SSDs and the optimal type and degree of therapy needed for prevention and remediation.

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