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Psychosocial Co-morbidities in Adolescents and Adults with Histories of Communication Disorders

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Abstract

Background—Few studies have considered the long-term psychosocial outcomes of individuals with histories of early childhood speech sound disorders (SSD). Research on long-term psychosocial outcomes of individuals with language impairment (LI) have frequently failed to consider the effects of co-morbid SSD. The purpose of this study was to compare individuals with histories of SSD with versus without LI on these outcomes and to examine the contributions of other comorbid conditions including reading disorders (RD) and ADHD.

Methods—Participants were adolescents aged 11–17 years ($N = 129$) and young adults aged 18–33 years ($N = 98$). Probands with SSD were originally recruited between 4 and 6 years of age and classified into SSD-only and SSD+LI groups. Siblings of these children were also assessed at this time and those without SSD or LI were followed as controls. Outcome measures at adolescence and adulthood included ratings of hyperactivity, inattention, anxiety, and depression, as well as internalizing, externalizing, social, and thought problems. Adult outcomes also included educational and employment status and quality of life ratings. Regression modeling was performed to examine the association of SSD, LI, RD, and ADHD with psychosocial outcomes using Generalized Estimating Equations.

Results—In the adolescent group, LI was associated with poorer ratings of psychosocial problems on all scales except depression. Histories of SSD-only, RD and ADHD did not independently predict any of the adolescent psychosocial measures. In contrast, LI in the adult sample was not significantly associated with any of the behavior ratings, though RD was related to higher ratings of hyperactivity and inattention and with higher parent ratings of internalizing and externalizing symptoms and thought problems. SSD did not predict any of the adult measures once other comorbid conditions were taken into account.

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Conclusions—Poor adolescent psychosocial outcomes for individuals with early childhood SSD were primarily related to comorbid LI and not to SSD per se. At adulthood comorbid RD and ADHD may influence outcomes more significantly than LI.

Keywords

Speech-sound disorder; language impairment; reading disorder; hyperactivity; inattention; internalizing; externalizing; longitudinal

Introduction

Speech sound disorders (SSD) are the most common communication disorder reported in preschool children with approximately 16% of children affected at age 4 (Campbell et al. 2003). Although the speech errors of many preschool-age children resolve, 4% of 6-year-old children continue to exhibit articulation and phonological errors (Shriberg, Tomblin, & McSweeney, 1999). Many children with SSD have comorbid language impairment (LI) and may be at risk for reading disorders (RD) and attention deficit-hyperactivity disorders (ADHD) as well. Shriberg, Tomblin, and McSweeney (1999) reported 11% to 15% comorbidity of SSD with LI (SSD+LI) at 6 years of age. Children with SSD are also at risk for RD, with an estimated 18% of children with SSD-only and 75% of children with SSD +LI demonstrating RD at school age (Lewis, Freebairn, & Taylor, 2000). LI and ADHD are often comorbid, with rates of comorbidity reported to be 30%–50% in children seen in ADHD clinics (Tannock & Schachar, 1996). Despite the high co-morbidity of these disorders, their relationship to the long-term psychosocial outcomes of children with histories of early communication disorders is not well understood. Most studies that have followed children with SSD-only and SSD+LI have not accounted for comorbid diagnoses in the assessment of psychosocial outcomes. The goal of this study is to compare adolescent and young adult psychosocial outcomes for individuals with early childhood SSD-only versus SSD+LI while also accounting for effects of other comorbid conditions.

Psychosocial outcomes for individuals with LI

Studies of children with LI – many of whom also had SSD – indicate adverse psychosocial outcomes relative to control groups, including poorer peer relationships, increased victimization, and more problems in social competence, adaptive functioning, emotional and self-regulation (Durkin & Conti-Ramsden, 2010). Children with LI are also at risk for mental health difficulties (e.g. somatic symptoms or problems with depressed, anxious, or angry mood), which may contribute to higher rates of unemployment and lesser educational attainment in adulthood (Johnson, Beitchman, & Brownlie, 2010; Law, Rush, Schoon, & Parsons, 2009).

Previous findings suggest that both the subtype of LI and the comorbid conditions accompanying it may impact psychosocial outcomes at adolescence. In a study of 71 15- to 16-year-old adolescents, Snowling et al. (2006) reported that youth whose LI resolved by 5 years had a good outcome with few psychiatric disorders. In contrast, youth with expressive language disorders were associated with attentional problems, combined receptive and

expressive language disorders with social difficulties, and low IQ and global language deficits with both attentional and social difficulties.

A recent systematic literature review of 19 studies composed of 553 children confirmed these findings (Yew & O'Kearney, 2013). Children with LI were twice as likely to report psychosocial disorders including internalizing symptoms (anxiety, mood disorder, and depression), externalizing symptoms (conduct disorder, oppositional defiance disorder, and antisocial personality) and ADHD than children with typical language development. Males were found to be more at risk for conduct disorders and depression than females. However, there was insufficient evidence to demonstrate a strong link between LI and one specific psychosocial problem, possibly related to heterogeneity within the LI impaired group and to failure to consider effects of comorbid conditions.

Psychosocial outcomes for individuals with SSD

Most studies have attributed poor outcomes of individuals with early communication problems to LI and have not considered comorbid SSD independently from LI. An early study by Baker and Cantwell (1982) that examined speech disorders separate from LI, reported high rates of psychiatric disorders as defined by the DSM-III for children who had LI without accompanying speech disorder (95%). Rates of these disorders were lower for children with combined speech and language disorders (45%) and speech disorders only (29%). The findings of Baker and Cantwell (1982) are difficult to interpret as children varied considerably in age (1 to 15 years) and the speech disorders group included children with diagnoses of stuttering and voice disorders, as well articulation disorders. Children with SSD-only were not separated from those with other disorders in examining psychiatric outcomes. Felsenfeld, Broen and McGue (1994) documented lower levels of educational attainment and occupational status in adults with histories of SSD compared to adults without histories of SSD. However, they also failed to separate the individuals with SSD-only from those with SSD+LI and it is thus difficult to know the extent to which these outcomes were related to SSD versus LI.

One of the few large longitudinal studies that investigated psychosocial outcomes in children with SSD with and without LI (Beitchman, Brownlie, & Wilson, 1996; Beitchman et al., 2001; Johnson, Beitchman, & Brownlie, 2010) recruited children at 5 years of age and followed them at 12, 19, and 25 years of age. At age 5 years, children with isolated speech disorders were as likely as children with combined speech and language disorders to present with psychiatric disorders, specifically ADHD and anxiety disorders. At 12 years, children with combined speech and language disorders presented with the highest rate of psychiatric disorders (57%), followed by children with language disorders only (42%). Children with histories of speech disorders only had the fewest psychiatric disorders (26%). At 19 years of age, individuals with early LI demonstrated increased rates of anxiety disorders compared to controls. The speech only group did not differ from controls at 19 years. At 25 years, individuals who had a history of LI demonstrated poorer communication, cognitive/academic, educational attainment and occupational status than individuals with histories of SSD-only. Children in the SSD-only group were more likely than those in the LI group to complete a university degree, work in a higher SES occupation, and earn \$50,000 or more

per year. However the groups did not differ in their perception of the quality of their life. Quality of life ratings were related to strong social networks of family and friends. These findings are in agreement with those of Records, Tomblin, and Freese (1992) who also reported no significant differences in the perception of the quality of life between young adults with histories of LI to those without LI.

Other evidence provides indirect support for potential negative social consequences of SSD-only. Silverman and Paulus (1989) found that high school sophomores rate a fictional peer with persistent, residual speech errors as less talkative, unpleasant, boring, nervous, and more isolated than a fictional control without speech errors, suggesting that peer reactions to students with SSD may be significant enough to increase risks for psychosocial problems. Qualitative interviews with children with SSD and their parents also indicate that speech difficulties can lead to frustration, embarrassment, teasing, and social isolation (McLeod, Daniel, & Barr, 2013).

In conclusion, most studies, while consistently demonstrating that LI is associated with poorer outcomes than SSD-only, have not linked LI to clinical psychiatric diagnoses. In fact most individuals with LI do not exhibit symptoms that warrant referral to a professional. Potential explanations for poorer psychosocial outcomes of individuals with SSD + LI compared to SSD-only include the more severe nature of the communication disturbance in those with the combined disorder (Beitchman et al., 1996), association of LI with limited working memory and processing capacity that impacts social skills (Bishop, 1997), and neurodevelopmental immaturity that underlies both LI and poor social competence (Beitchman et al., 1996). While studies have reported high rates of comorbid conditions of RD (Tomblin, Zhang, Buckwalter, & Catts, 2000) and ADHD for children with SSD+ LI compared to those with SSD-only (Lewis et al., 2012; McGrath, Hutaff-Lee, Scott, Boada, Shriberg, & Pennington, 2008), studies have not examined the relative contribution of these disorders to psychosocial outcome measures.

Summary and Theoretical Model

Previous research on the psychosocial difficulties in individuals with speech and language disorders has focused on children with LI rather than on SSD. These studies describe internalizing symptoms including depression and anxiety and externalizing symptoms such as oppositional behavior, atypical thinking, and poor social skills as psychosocial outcomes of early childhood LI (Yew & O'Kearney, 2013). The failure of these investigations to identify more specific behavior problems may reflect sample heterogeneity, as researchers have not considered SSD independently from LI or taken into account co-morbid conditions such as ADHD and RD. Psychosocial outcomes of SSD may also depend on the evolution of the child's SSD (recovered or persistent) and may vary with age, cognitive abilities such as IQ, and gender.

Our overriding theoretical model of SSD is that psychosocial outcomes are multifactorial and influenced by comorbid conditions (LI, ADHD, and RD) as well as the age of the individual when outcomes are assessed. In the current study, we examined individuals with histories of early SSD, at adolescence and adulthood on measures of internalizing, externalizing, thought and social problems controlling for co-morbid conditions of LI,

ADHD and RD. We assessed a broad range of psychosocial outcomes of early childhood SSD, including those that have revealed problems in children with LI.

The present study investigated differences in psychosocial outcome between individuals categorized in early childhood as having SSD-only or SSD+LI compared to sibling controls without either SSD or LI. This study adds to previous work on psychosocial outcomes of children with communication disorders in that it reports on a large well characterized cohort of individuals with early childhood SSD who were followed prospectively from 4–6 years of age into adolescence and adulthood. This study also considered SSD separately from LI and evaluated the contributions of co-morbid disorders of RD and ADHD to psychosocial outcomes. Unlike previous work, both parent-report and self-report of outcomes were assessed.

Specific research questions addressed were:

1. Do adolescents and young adults with a history of SSD + LI differ from individuals with a history of SSD-only or no history of SSD or LI on measures of psychosocial outcomes?
2. What are the independent contributions of SSD, LI, RD, and ADHD to the psychosocial outcomes of individuals with early childhood histories of SSD?

Methods

Participants

The current sample was a subset of a longitudinal family study of speech and language disorders (Lewis et al., 2012). The sample included 129 adolescents and 98 young adults recruited from Northeast Ohio. Probands with SSD were recruited at early childhood (4–6 years of age) from the clinical caseloads of Speech/Language Pathologists. Probands and their siblings were subsequently tested and categorized as SSD-only or SSD+LI or unaffected sibling controls. The participants were then followed during their school-age years and invited between 2008 and 2013 to participate in a final follow-up that included assessments of psychosocial outcomes.

Participants in the final assessment were divided by age into an adolescent sample ages 11 to 17 years ($M = 14.7$ years; $SD = 2.3$) and a young adult sample ages 18 to 33 years ($M = 22.3$ years; $SD = 3.9$). Participant characteristics are presented in Table 1. The SSD+LI groups reported higher rates of RD and ADHD than the SSD-only or No SSD/LI groups. Groups were not significantly different in age, gender or SES. The adolescent group was comprised of 49 females and 80 males. The adult group was comprised of 44 females and 54 males. At the initial assessment, the followed sample included fewer individuals with No SSD/LI than the children who were not followed but these two subsets did not differ significantly in gender or SES (data not shown). The study was approved by the Institutional Review Board of University Hospitals Case Medical Center and informed consent and assent was obtained from the participants.

Recruitment and Initial Assessment

At the time of recruitment, each consenting family participant completed a 3½-4-hour assessment carried out by Masters-level SLPs. Tests of speech, language, and intelligence were administered in counterbalanced order following recruitment when the children were 4 to 6 years of age. Family SES was determined at the initial assessment based on parent education levels and occupations using the Hollingshead Four Factor Index of Social Class (Hollingshead, 1975). Eligibility criteria for all participants were as follows: normal hearing and middle ear function, normal facial and oral structures, absence of neurological disorders and developmental delays other than speech and language, and normal cognitive skills as measured by the Performance Subscale of the Wechsler Preschool and Primary Scale of Intelligence- Revised (Wechsler, 1989) or the Wechsler Intelligence Scale for Children-Third Edition (Wechsler, 1991). See Lewis et al. (2012) for detailed description.

SSD was diagnosed in participants scoring below the 10th percentile of articulation on the Goldman-Fristoe Test of Articulation-Sounds in Words subtest (GFTA-2; Goldman & Fristoe, 2000), and by the presence of at least four phonological process errors on the Kahn-Lewis Phonological Analysis (KLPA; Khan & Lewis, 1986). Comorbid LI was diagnosed in participants who scored greater than 1 SD below the mean on the Clinical Evaluation of Language Fundamentals – Preschool (CELF-P; Wiig, Secord, & Semel, 2004) or Test of Language Development - Primary 3rd Edition (TOLD-P; Newcomer & Hammill, 1997) prior to enrollment in speech therapy. The No SSD/LI control group was composed of siblings of probands who did not meet criteria for either SSD or LI. Co-morbid conditions of ADHD or RD were determined by parent report at the school-age follow-up assessment.

Follow-Up Procedures and Measures

Status with regard to ongoing SSD-only, SSD+LI, and RD was not formally assessed in all participants at adolescence or adulthood. A subgroup of this cohort participated in an assessment of speech, language and literacy skills at adolescence. Individuals with SSD + LI at early childhood had poorer outcomes than those with histories of SSD-only or no SSD/LI. Poorer language and literacy outcomes in adolescence were associated with persistent speech sound problems, lower PIQ, and lower SES. These findings are reported in Lewis et al (2015). For the current study, a psychosocial assessment battery was administered in-home or via mail during the final 5 years of the study, with parallel measures for adolescent and young adult participants as described below.

Hyperactivity and inattention—Symptoms of hyperactivity and inattention for adolescents and adults were assessed with the ADHD Rating Scale-IV Home Version, an 18-item parent-report behavioral checklist (DuPaul, Power, Anastopoulos, & Reid, 1998). Parents completed the ratings for both the adolescent and adult groups. As the normative data only extends to 18 years, the 18-year normative data was used for the young adults. Ratings of hyperactivity and inattention were adjusted for age using Z-scores.

Anxiety—Symptoms of anxiety in the adolescent group were assessed with the Revised Children's Manifest Anxiety Scale (RCMAS-2; Reynolds & Richmond, 2008). The RCMAS-2 is a 49-item self-report scale for youth aged 6 to 19 years. Symptoms of anxiety

in the young adult group were assessed with the Adult Manifest Anxiety Scale (AMAS; Reynolds, Richmond, & Lowe, 2003). The AMAS is a 36-item self-report scale for adults aged 19 and above. The measures considered in analysis were the T-scores for the RCMAS and AMAS subscales assessing worry, physiological symptoms, and social anxiety.

Depression—Symptoms of depression in the adolescent group were assessed with the Children's Depression Inventory (CDI; Kovacs, 1992). The CDI is a brief, age-normed, 27-item self-report assessment of cognitive, affective, and behavioral signs of depression in youth. T-scores were used in analyses. Symptoms of depression in the young adult group were assessed with the Beck Depression Inventory (BDI; Beck, Ward, & Mendelson, 1961). The BDI is a brief 21-item self-report rating inventory that assesses the severity of cognitive and behavioral symptoms of depression in adults. Raw score totals for the BDI were considered in analysis.

Behavior and mood problems—Behavior and mood problems for adolescents were assessed with the Youth Self-Report (YSR; self-report) and Child Behavior Checklist (CBCL; parent-report) of the Achenbach System of Empirically Based Assessment for youth aged 6–18 years (ASEBA; Achenbach & Rescorla, 2001). Summary scores from the CBCL and YSR's 112 multiple-choice items reported in the current study included age- and sex-normed T-scores for internalizing disorders, externalizing disorders, thought problems, and social problems.

Behavior and mood problems for adults were assessed with the Adult Self-Report (ASR; self-report) and Adult Behavior Checklist (ABCL; parent-report) of ASEBA for adults (Achenbach & Rescorla, 2003). Summary scores from the ABCL and ASR's 126 multiple-choice items reported in the current study included gender and age-normed T-scores internalizing disorders, externalizing disorders, and thought problems. ASEBA forms were scored electronically with Assessment Data Manager (ADM v. 7.2B; Achenbach 1999–2007).

The Internalizing Scale assesses problems such as anxiety, depression, withdrawn and somatic complaints. The Externalizing Scale assesses problems such as conduct disorder, opposition defiance disorder, ADHD, and antisocial personality. It measures aggressive behavior, rule breaking behavior, and intrusive behavior. The Thought Problem Scale measures symptoms of psychiatric disorders including hallucinations, OCD symptoms, strange thoughts and behaviors, self-harm and suicide attempts. Thought problems have been associated with OCD, pediatric bi-polar disorder, mania, and schizophrenia. The Social Problems Scale of the YSR and CBCL includes items that assess how well the adolescent gets along with others. Items include teasing, how well liked the individual perceives himself to be, and dependency.

Educational, employment, and social outcomes—Self-report data on educational and employment status, independence, and social participation for the adult group were obtained using the Present Life Survey (PLS, Records, Tomblin, & Freese, 1992). Responses were coded categorically based on educational attainment, employment status (employed/unemployed), independence (living by self or with family), marital/cohabitation status

(living alone versus married or cohabitating), and participation/membership in social groups (participating or not). Life satisfaction was assessed on a Likert scale in response to two questions: “How satisfied are you with your life as a whole?” and “How happy would you say you are?”.

Data Analysis

Analysis of variance (ANOVA) and chi square analyses were conducted to compare the adolescent and adult groups based on the early childhood classifications of SSD-only, SSD+LI, and No SSD/LI. To account for multiple testing, we conservatively corrected for 12 ANOVAs for the adolescent group and 10 ANOVAs for the adult group and set the alpha level at .004 and .005 respectively (i.e. .05/12 and .05/10). Significant group effects were followed by Tukey post-hoc comparisons to determine how the groups differed from one another. Chi square was employed to compared groups in the young adult sample on categorical outcomes from the PLS. Chi square analyses were also conducted to compare the number of individuals in the adolescent and adult groups with scores on the psychosocial measures that fell into the clinical range based on test criteria. Correlational analyses between the self-ratings and parent-ratings of the adolescents and adults were also conducted.

Generalized Estimating Equations (GEE) were used to determine predictors of anxiety, depression, internalizing, externalizing, thought problems and social problems of the adolescent and adult groups controlling for sibling clusters. Ratings of hyperactivity and inattention were adjusted for age. A backwards stepwise modelling approach was employed, entering all variables in the model initially and removing variables that were not significant until the most parsimonious model was obtained based on individual p-values and the likelihood ratio test comparing nested models. A backwards stepwise modelling approach was employed for two reasons. First, by including all the variables in the model, we could see which variables might be most relevant after the inclusion of all others. Second, backward modelling utilizes complete data observations correcting for missing data. All models were validated using forward modelling. Predictors entered into the model included SSD, LI, RD and ADHD, as well as SES and sex.

Results

ANOVAs of the adolescent measures revealed differences among the groups on both parent, $F(2,127)=10.4$, $p<.001$, and self-report, $F(2,127)=4.6$, $p=.012$, of social problems, with the SSD+LI group scoring more poorly than the SSD-only and No SSD groups (Table 2). Parent ratings of adolescent thought problems were also significantly different among the groups, $F(2,127)=3.75$, $p=.026$, although post-hoc Tukeys were not significant. Effect sizes for these findings were small. Group differences were not significant for any of the young adult psychosocial ratings (Table 3). Chi square analyses did not reveal significant group differences on the PLS (data not shown). As seen in Table 4, self-report and parent-report measures were weakly to moderately correlated for all measures. This is in agreement with other research that has demonstrated self-ratings of adolescents underestimate difficulties

while parent-ratings provide a more accurate assessment of psychosocial difficulties (Taylor, Margevicius, Schluchter, Andreias, & Hack, 2015).

Few individuals were identified as scoring within the clinical range on the adolescent psychosocial measures (ranging from 1 to 14 individuals in the total adolescent group; Tables 5). Chi square comparisons among the adolescent groups revealed a significantly higher number of individuals in the clinical range for parent report of thought problems ($\chi^2=9.07$, $p=.011$) and social problems ($\chi^2=6.14$, $p=.046$) with more individuals in SSD+LI group scoring in the clinical range than in the SSD-only or no SSD/LI groups. Similarly, few young adults scored within the clinical range on the adult psychosocial measures (ranging from 7 to 15 individuals in the total adult group; Table 6). Chi square comparisons among the adult groups revealed a significantly higher number of individuals in the clinical range for parent ratings of hyperactivity ($\chi^2=6.35$, $p=.042$) with more individuals in SSD+LI group scoring in the clinical range than in the SSD-only or no SSD/LI groups.

Results from mixed model analyses of adolescent outcomes revealed that LI significantly predicted all the self- and parent- ratings of psychosocial problems except depression which was not predicted by any variables in the model (Table 7). Models were controlled for age, SES and sex of the participant. SES was significantly related to RCMAS-2, YSR social problems, and the CBCL. Age was significant for hyperactivity and inattention. SSD, RD, and ADHD were not independently predictive of psychosocial outcomes, though RD approached significance in predicting anxiety ratings ($p=.071$). These findings suggest that LI is related to psychosocial outcomes in adolescence and that this association is not independently accounted for by SSD, RD, or ADHD.

Results from mixed model analyses of adult outcomes demonstrated that LI was not significantly associated with any of the psychosocial ratings after accounting for RD, ADHD, SES and family structure (Table 8). Models were controlled for SES and sex of the participant. The analysis of ADHD was also controlled for age. SES was significant for AMAS, ASR Internalizing, ABCL Internalize and Thought Problems. SSD and LI were not significant in any of the final models though there was a non-significant trend for LI to predict parental ratings of thought problems ($p=0.056$). Neither communication disorder (SSD-only, SSD+LI) nor any of the co-morbid disorders was associated with anxiety or depression. However, RD predicted hyperactivity and inattention, and ADHD was associated with parent ratings of internalizing, externalizing and thought problems but not with any of the self-ratings.

Discussion

This study is one of few to examine long-term adolescent and adult psychosocial outcomes in individuals with histories of early childhood SSD and, to our knowledge, the first to account for co-morbid conditions of LI, RD, and ADHD while controlling for SES, gender and family structure. Findings support the hypothesis that individuals with histories of LI are at greater risk for psychosocial problems than either those with no SSD/LI or those with SSD-only. Adolescents with histories of SSD+LI had higher parent-ratings of thought problems and higher parent-ratings and self-ratings of social problems than either siblings

without histories of SSD/LI or the SSD-only subgroup. In contrast, comparison of young adult groups failed to reveal significant differences between the SSD-only, SSD+LI, and No SSD/LI groups for any of the outcomes. Few individuals in either the adolescent or adult groups scored within the clinical range on the psychosocial measures, with adolescents with combined SSD+LI scoring within the clinical range more often than those with SSD-only or No SSD/LI. Findings from mixed models suggested different outcomes in adolescence and young adulthood. For the adolescent sample LI predicted higher ratings of behavior problems on all scales except depression, while failing to indicate independent contributions of RD or ADHD to psychosocial outcomes. Conversely, for the young adult sample, LI did not predict any of the psychosocial outcomes, while RD was associated with hyperactivity and inattention ratings and ADHD with parent report of internalizing, externalizing and thought problems. This suggests that LI at adulthood is not as predictive of psychosocial outcomes as it was at adolescence.

Adolescent Outcomes

Adolescents with histories of early SSD, with and without LI, have generally good psychosocial outcomes. This is contrary to the findings of an early study by Baker and Cantwell (1982) that reported high rates of psychiatric disorders for children with SSD+LI (45%) and SSD-only (29%). Nevertheless, the rate of self-reported social problems that fall in the clinical range for our group of adolescents with SSD+LI was 19.5%, a rate higher than the rates of these problems for adolescents with histories of SSD-only or adolescents without histories of SSD or LI (both at 7.7%, see Table 5). In addition, 19.5% of adolescents with SSD+LI were rated by their parents as demonstrating thought problems within the clinical range. These findings are consistent with those of the earlier study in suggesting the need for professionals such as SLPs to be sensitive to psychosocial problems of the adolescent with combined SSD and LI. Even though only a minority of the adolescents had problems within the clinical range, ratings of psychosocial problems were elevated for the SSD+LI group relative to the other two group of children with SSD. Elevated ratings on these measures are not sufficient for a diagnosis of a psychiatric disorder as such diagnoses are based on multiple factors including history and interviews. As in previous research we did not find links between specific psychiatric disorders to LI (Yew & O'Kearney, 2013).

Group differences in both parent-report and self-report of social problems as assessed by the Social Problems subscales of the YSR and CBCL suggests difficulties in peer relationships. These findings are in agreement with previous reports of difficulty with peers, bullying, and lack of social competence (Durkin & Conti-Ramsden, 2010; Hughes, 2014). Individuals with LI may have poor pragmatic language skills and/or poor language comprehension that impairs their ability to read social situations and to respond appropriately. Evidence for social problems in the SSD+LI group is also consistent with the hypothesis that neurodevelopmental immaturity contributes to deficiencies in both social competence and language (Beitchman, Brownlie, & Wilson, 1996).

Higher ratings of adolescent thought problems in the SSD+LI group compared to SSD-only and No SSD/LI were found for parent-report but not self-report, suggesting that the SSD+LI group exhibits more atypical behaviors or perceptions compared to peers without speech and

language disorders. Adolescents with SSD+LI also had higher rates of comorbid RD and ADHD, suggesting greater comorbidity for these adolescents compared to those with histories of SSD-only or controls.

Young Adult Outcomes

Few individuals in the young adult group scored within the clinical range on the psychosocial measures ranging from 7% to 16% of the total adult sample. The SSD + LI group had more individuals with elevated ratings of hyperactivity than the SSD-only or No SSD+LI groups, however this number of individuals with hyperactivity was small (n=16% of the SSD+LI group). Group analyses revealed that the young adult groups did not differ significantly on any of the self- or parent- ratings of psychosocial problems. Although the different outcomes for the young adults compared to the adolescents may reflect unmeasured background differences between the two samples, it is conceivable that problems evident in adolescence begin to subside by early adulthood, possibly due to the development of more effective coping strategies, opportunities to pursue interests that place less emphasis on language skills, or diminished exposure to victimization by peers. The PLS also failed to reveal any group differences in education level, living situation, income, marital status, social life satisfaction, total life satisfaction, happiness, and the number of club memberships. These findings are similar to those of Records, Tomblin and Freese (1992), who reported that young adults with histories of LI had lower educational levels than controls but failed to find differences in marital status, living situation, income level, life satisfaction, and happiness. Previous studies (Johnson, Beitchman, & Brownlie, 2010; Young et al., 2002) also found lower educational and occupational attainment for young adults with histories of LI than for those with histories of SSD-only or controls. However, similar to the present findings, they reported no difference in the adults' perception of their quality of life. One explanation for the disparity between the findings by Johnson et al. (2010) and those of the current study is that their sample was community based and included individuals with low IQ, whereas the present sample was recruited from clinical caseloads and required participants to demonstrate a normal PIQ.

Limitations

One of the limitations of this study is that psychosocial outcomes were evaluated by ratings rather than diagnostic interviews. The present findings suggest an elevation in the SSD+LI subgroup in symptoms of social problems, but do not provide information on rates of psychiatric diagnoses. More comprehensive assessments are needed for rigorous evaluation of outcomes, including psychiatric interviews, surveys of family and social relationships, educational attainments during and after high school, employment status, and quality of life. A further limitation relates to sampling procedures. Sample size was limited, particularly in the young adult cohort, and the samples may not be representative of the larger population of adolescents and young adults with histories of SSD. Probands with SSD were originally recruited from the clinical caseloads of treating speech/language pathologists and only a portion of the original subjects were assessed as adolescents or young adults. Additionally, because the adolescent and young adult samples may have differed on unmeasured background or selection factors, follow-up of the same sample would be preferable in investigating longitudinal changes in psychosocial outcomes. Collection of outcomes data at

multiple points across childhood and into emerging adulthood would also have provided a clear picture of the developmental trajectories of behavior problems in association with both SSD and its comorbidities.

Other limitations include the possibility that the sibling controls may not have been representative of children without family histories of SSD, as genetic factors contributing to SSD in the probands may have may have adversely affected speech and language development or related skills in the sibling controls. A bias of this type would have made it more difficult to detect deficits in the probands relative to sibling controls. The differences observed in this study may under-estimate the negative long-term psychosocial consequences of SSD+LI. Additionally, the present samples did not include groups with LI-only, which would have permitted assessment of the separate contributions of SSD and LI to outcomes. A measure of pragmatic language would have been informative given the association of LI to social problems. Finally, the methods and limited sample size did not permit assessment of either the severity or persistence of SSD and LI beyond early childhood. Research suggests that children with persistent SSD have more psychosocial, academic and attentional problems during childhood (Snowling, Bishop, Stothard, Chipchase, & Kaplan, 2006), but it is unclear if these adverse effects lead to longer-term difficulties in adjustment.

Conclusions and Clinical Relevance

Overall the findings from this study suggest good psychosocial outcomes for adolescents and adults with histories of early childhood SSD, especially if no other comorbid conditions are present. The rate of self-reported social problems that fall in the clinical range for our group of adolescents with SSD and comorbid LI was 19.5%, a rate higher than the rates of these problems for adolescents with histories of SSD-only or adolescents without histories of SSD or LI. In addition, 19.5% of adolescents with SSD+LI were rated by their parents as demonstrating thought problems within the clinical range. While these individuals did not receive a comprehensive clinical assessment for psychosocial problems, the findings are consistent with those of earlier studies that suggested that professionals such as SLPs be sensitive to psychosocial problems of the adolescent with combined SSD and LI. SLPs should be aware of the increased risk of social and thought problems in adolescents with SSD+LI that may justify referrals for mental health services.

Other comorbid disorders such as RD and ADHD may contribute independently of LI to these outcomes. The persistence of these problems into adolescence suggests the need for careful monitoring of psychosocial adjustment and for earlier interventions. Withdrawal of all services with improved language skills and resolution of LI, thus, may be ill-advised (Conti-Ramsden, et al., 2012). Clinicians should consider the nature of the child's communication disorder, and comorbid conditions when determining if a child is at risk for long-term psychosocial difficulties.

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Abbreviation

SSD	Speech-sound disorder
LI	language impairment
RD	reading disorder
ADHD	attention deficit-hyperactivity disorder

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Highlights

- Adults and adolescents with SSD only have relatively good psychosocial outcomes.
- Individuals with SSD and LI are at higher risk for ADHD, and psychosocial problems.
- Other comorbid conditions contribute to poorer young adult psychosocial outcomes.

Table 1

Demographic Characteristics and Group Differences in Study Participants

	Adolescent Group (N = 129)				Adult Group (N = 98)			
	No SSD/LI (n = 44)	SSD-only (n = 43)	SSD + LI (n = 42)	p	No SSD/LI (n = 39)	SSD-only (n = 28)	SSD + LI (n = 31)	p
Participant characteristics:								
Age, mean (SD)	14.7(2.3)	15.3(1.9)	14.6(1.7)	NS	22.3(3.9)	22.5(3.4)	22.2(3.3)	NS
Female sex: n (%)	18 (46%)	16 (37%)	15 (36%)	NS	22 (56%)	13 (46%)	9 (29%)	NS
Reading Disorder, n (%)	6(15%)	3(7%)	20(48%)	<.001	8(21%)	3(11%)	18(58%)	<.001
ADHD, n (%)	5(14%)	1(3%)	12(33%)	.001	6(19%)	4(15%)	13(52%)	.005
Family characteristics:								
Hollingshead SES:				0.06				NS
1	2 (5%)	0 (0%)	4 (10%)		0 (0%)	0 (0%)	2 (7%)	
2	6 (16%)	2 (5%)	1 (2%)		6 (16%)	4 (15%)	4 (14%)	
3	3 (8%)	3 (7%)	8 (20%)		6 (16%)	6 (22%)	7 (24%)	
4	11 (30%)	18 (43%)	11 (27%)		14 (37%)	10 (37%)	12 (41%)	
5	15 (41%)	19 (45%)	17 (42%)		12 (32%)	7 (26%)	4 (14%)	
Not reported	7	1	1		1	1	2	

Test statistics are F values from ANOVA for continuous variables and chi-square values for categorical comparisons. SSD= speech-sound disorder; LI= language impairment; SES= socioeconomic status.

NS=not significant.

*
p < .05;

**
p < .001;

Table 2

Adolescent Group Comparisons on Self-report and Parent-report Measures of Psychosocial Outcome

Adolescent Group (N = 129)						
Measures	No SSD/LI Mean(SD) (n = 44)	SSD-only Mean(SD) (n = 43)	SSD + LI Mean(SD) (n = 42)	Eta ²	F	p
Self –Report:						
RCMAS-2	41.6(9.95)	43.1(9.6)	45.1(9.0)	.022	1.31	.273
CDI	42.2(6.6)	43.7(9.6)	42.5(7.3)	.007	0.27	.767
YSR Internalizing	47.8(9.9)	48.8(9.2)	51.2(10.8)	.021	1.24	.293
YSR Externalizing	47.0(9.9)	48.3(7.6)	50.8(9.3)	.033	1.96	.146
YSR Thought problems	53.4(6.1)	52.6(3.2)	54.9(5.3)	.036	2.15	.121
YSR Social Problems ^{ab}	54.3(5.7)	53.7(5.4)	57.6(7.1)	.074	4.63	.012 [*]
Parent Report:						
ADHD Rating Scale-IV Hyperactivity	22.6(32.0)	15.6(24.7)	31.9(34.1)	.048	2.79	.065
ADHD Rating Scale-IV Inattention	37.7(37.3)	31.2(26.3)	44.8(33.9)	.029	1.69	.189
CBCL Internalizing	46.9(10.4)	46.9(10.3)	50.3(11.1)	.022	1.32	.272
CBCL Externalizing	44.4(8.8)	44.2(8.1)	47.2(9.3)	.025	1.47	.233
CBCL Thought Problems	53.2(5.4)	52.1(3.2)	55.4(7.1)	.061	3.75	.026 [*]
CBCL Social Problems ^{ab}	52.1(4.1)	51.8(4.0)	56.3(6.4)	.153	10.41	<.001 ^{**}

RCMAS-2=Revised Children's Manifest Anxiety Scale- 2nd Ed.; CDI=Children's Depression Inventory; YSR=Youth Self-Report; CBCL=Child Behavior Checklist.

SSD: speech-sound disorder; LI: language impairment; No SSD/LI: sibling control group.

^aSSD+LI differs from SSD only,

^bSSD+LI differs from No SSD/LI

^{*} $p < .05$;

^{**} $p < .001$.

Table 3

Adult group comparisons on self-report and parent-report measures of psychosocial outcome

Young Adult Group (N =170)						
Measures	No SSD/LI (n =37)	SSD-only (n =26)	SSD + LI (n = 29)	Eta ²	F	p
Self -Report Measures						
AMAS	56.4(9.4)	53.5(10.0)	54.0(7.8)	.022	0.93	.401
BDI	7.1(8.3)	6.3(6.8)	6.6(7.3)	.002	0.10	.908
ASR Internalizing	52.0(12.8)	47.6(12.2)	50.6(12.3)	.021	0.90	.410
ASR Externalizing	50.6(9.1)	50.0(10.9)	50.5(9.2)	.001	0.02	.978
ASR Thought problems	56.6(8.6)	53.0(7.3)	54.1(6.2)	.042	1.84	.165
Parent Report Measures						
ADHD Rating Scale-IV Hyperactivity	22.9(31.7)	35.0(37.1)	41.4(41.8)	.049	1.92	.154
ADHD Rating Scale-IV Inattention ^b	33.6(33.7)	36.8(34.6)	53.7(32.1)	.068	2.68	.075
ABCL Internalizing	49.3(12.7)	49.0(10.3)	52.5(11.1)	.017	0.69	0.50
ABCL Externalizing	49.6(8.8)	50.4(11.1)	52.3(10.3)	.020	0.56	.571
ABCL Thought Problems	53.4(6.7)	52.3(3.4)	56.8(8.7)	.070	2.85	.064

AMAS= Manifest Anxiety Scale; BDI=Beck Depression Inventory; ASR=Adult Self-Report; ABCL=Adult Behavior Checklist.

SSD: speech-sound disorder; LI: language impairment; No SSD/LI: sibling control group.

^b SSD+LI differs from No SSD/LI

Table 4

Correlations between self-report and parent-report for adolescents and adults

Domain	Adolescent self- and parent- report	Adult self- and parent- report
Internalizing	.393 **	.381 **
Externalizing	.448 **	.365 **
Thought Problems	.247 **	.412 **
Social Problems	.499 **	NA

Note:

**
p<.01;*
p<.05

Table 5

Percentage of adolescents scoring in the clinical range on Self-report and Parent-report Measures of Psychosocial Outcome

Adolescent Group						
Measures	No SSD/LI	SSD-only	SSD + LI	Total	χ^2	p
Self –Report:						
RCMAS-2	0	1(2.4%)	0	1(.8%)	1.85	.397
CDI	0	2(7.4%)	1(3.7%)	3(3.6%)	2.20	.332
YSR Internalizing	2(5.1%)	2(5.1%)	4(9.8%)	8(6.7%)	.918	.632
YSR Externalizing	1(2.6%)	1(2.6%)	5(12.2%)	7(5.9%)	4.50	.105
YSR Thought problems	4(10.3%)	0	1(2.4%)	5(4.2%)	5.58	.061
YSR Social Problems	3(7.7%)	3(7.7%)	8(19.5%)	14(11.8%)	3.62	.164
Parent Report:						
ADHD Rating Scale-IV Hyperactivity	0	0	2(4.9%)	2(1.7%)	3.67	.159
ADHD Rating Scale-IV Inattention	3(8.3%)	1(2.6%)	3(7.3%)	7(6.1%)	1.22	.543
CBCL Internalizing	4(10.3%)	4(10.5%)	5(12.2%)	13(11.0%)	.090	.956
CBCL Externalizing	1(2.6%)	0	2(4.9%)	3(2.5%)	1.89	.388
CBCL Thought Problems	3(7.7%)	0	8(19.5%)	11(9.3%)	9.07	.011 *
CBCL Social Problems	2(5.1%)	1(2.5%)	7(17.1%)	10(8.5%)	6.14	.046 *

RCMAS-2=Revised Children's Manifest Anxiety Scale- 2nd Ed.; CDI=Children's Depression Inventory; YSR=Youth Self-Report; CBCL=Child Behavior Checklist.

SSD: speech-sound disorder; LI: language impairment; No SSD/LI: sibling control group.

*
p .05;

**
p < .001.

Table 6

Percentage of young adults scoring in the clinical range on self-report and parent-report measures of psychosocial outcome

Young Adult Group						
Measures	No SSD/LI	SSD-only	SSD + LI	Total	χ^2	p
Self -Report Measures						
AMAS	7(20.6%)	4(16.7%)	2(7.1%)	13(15.1%)	2.23	.329
BDI	3(5.8%)	3(6.0%)	3(7.0%)	9(6.2%)	.065	.968
ASR Internalizing	8 (22.2%)	2(7.4%)	4(13.8%)	14(15.2%)	2.691	.260
ASR Externalizing	2(5.6%)	3(11.1%)	2(6.9%)	7(7.6%)	.708	.702
ASR Thought problems	7(19.4%)	3(11.1%)	5(17.2%)	15(16.3%)	.812	.666
Parent Report Measures						
ADHD Rating Scale-IV Hyperactivity	2(4.1%)	1(2.6%)	6(16.2%)	9(7.3%)	6.35	.042 *
ADHD Rating Scale-IV Inattention	2(4.1%)	3(7.9%)	6(16.2%)	11(8.9%)	3.91	.142
ABCL Internalizing	5(14.7%)	2(10.0%)	3(11.1%)	10(12.3%)	.315	.854
ABCL Externalizing	2(5.9%)	2(10.0%)	3(11.1%)	7(8.6%)	.583	.747
ABCL Thought Problems	2(5.9%)	1(5.0%)	4(14.8%)	7(8.6%)	1.96	.374

AMAS= Manifest Anxiety Scale; BDI=Beck Depression Inventory; ASR=Adult Self-Report; ABCL=Adult Behavior Checklist.

SSD: speech-sound disorder; LI: language impairment; No SSD/LI: sibling control group.

*
p .05;

**
p < .001.

Table 7

Results from Mixed Model Analyses of Predictors of Psychosocial in Outcomes in Adolescent Sample, Controlling for Sibling/Family Clusters

Measure	Predictor	β (SE)	p
Self-Report:			
RCMAS-2	LI RD	-6.56(2.06) 3.91(2.17)	.001 ** .071
CDI	NS		
YSR Internalizing	LI	-4.97(2.04)	.015 *
YSR Externalizing	LI	-5.58(1.76)	.002 *
YSR Thought Problems	LI	-2.80(1.07)	.009 *
YSR Social Problems	LI	-4.52(1.33)	.001 **
Parent Report:			
ADHD Rating Scale-IV Hyperactivity	LI Age	-20.72(6.65) -1.37(1.53)	.002 * .372
ADHD Rating Scale-IV Inattention	LI Age	-24.61(6.68) 0.87(1.54)	<.001 ** .571
CBCL Internalizing	LI	-6.64(2.13)	.002 *
CBCL Externalizing	LI	-5.36(1.78)	.003 *
CBCL Thought Problems	LI	-4.58(1.28)	<.001 **
CBCL Social Problems	LI	-5.59(1.09)	<.001 **

Estimates of fixed effects for mixed models include betas and standard errors. Models controlled for SES and the sex of the participants. SES was significant for RCMAS-2, YSR Social Problems, and the CBCL. Age was significant for hyperactivity and inattention.

RCMAS-2=Revised Children's Manifest Anxiety Scale- 2nd Ed.; CDI=Children's Depression Inventory; YSR=Youth Self-Report; CBCL=Child Behavior Checklist. SSD: speech-sound disorder; LI: language impairment; No SSD/LI: sibling control group.

NS=not significant

*
p .05;

**
p < .001;

Table 8

Results from Mixed Model Analyses of Predictors of Psychosocial in Outcomes in Adult Sample, Controlling for Sibling/Family Clusters

Measure	Predictor	β (SE)	p
Self-Report:			
AMAS	SEX	-5.54(2.21)	.012 *
BDI	NS		
ASR Internalizing	SEX	-5.31(4.70)	.072
ASR Externalizing	NS		
ASR Thought Problems	NS		
Parent Report:			
ADHD Rating Scale-IV Hyperactivity	RD	-35.57(10.68)	.001 **
ADHD Rating Scale-IV Inattention	RD	-36.55(8.66)	<.001 **
ABCL Internalizing	ADHD	-11.55(2.60)	<.001 **
ABCL Externalizing	ADHD	-10.84(2.97)	<.001 **
ABCL Thought Problems	ADHD LI	-7.18(1.73) -3.19(1.67)	<.001 ** .056

Estimates of fixed effects for mixed models include betas and standard errors. Models controlled for SES and sex of the participants. SES was significant for AMAS, ASR Internalizing, ABCL internalizing and thought problems. Analysis of ADHD ratings controlled for age.

AMAS= Manifest Anxiety Scale; BDI=Beck Depression Inventory; ASR=Adult Self-Report; ABCL=Adult Behavior Checklist.

SSD: speech-sound disorder; LI: language impairment; No SSD/LI: sibling control group.

NS=not significant

* $p < .05$;

** $p < .001$;