

## Research Forum

# Language Impairment in the Attention-Deficit/Hyperactivity Disorder Context

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**Purpose:** Attention-deficit/hyperactivity disorder (ADHD) is a ubiquitous designation that affects the identification, assessment, treatment, and study of pediatric language impairments (LIs).

**Method:** Current literature is reviewed in 4 areas: (a) the capacity of psycholinguistic, neuropsychological, and socioemotional behavioral indices to differentiate cases of LI from ADHD; (b) the impact of co-occurring ADHD on children's LI; (c) cross-etiology comparisons of the nonlinguistic abilities of children with ADHD and specific LI (SLI); and (d) the extent to which ADHD contributes to educational and health disparities among individuals with LI.

**Results:** Evidence is presented demonstrating the value of using adjusted parent ratings of ADHD symptoms and

targeted assessments of children's tense marking, nonword repetition, and sentence recall for differential diagnosis and the identification of comorbidity. Reports suggest that the presence of ADHD does not aggravate children's LI. The potential value of cross-etiology comparisons testing the necessity and sufficiency of proposed nonlinguistic contributors to the etiology of SLI is demonstrated through key studies. Reports suggest that children with comorbid ADHD+LI receive speech-language services at a higher rate than children with SLI.

**Conclusion:** The ADHD context is multifaceted and provides the management and study of LI with both opportunities and obstacles.

Attention-deficit/hyperactivity disorder (ADHD) represents one of the most common conditions diagnosed in children. The disorder's core symptoms of elevated levels of inattention, hyperactivity, and impulsivity begin at an early age and continue throughout the life span, negatively affecting individuals across educational, social, and vocational domains, as well as creating substantial familial and societal burdens (cf. Barkley, 2006). The expected prevalence of ADHD is 5–7% (American Psychiatric Association, 2013; Willcutt, 2012), but considerable regional differences exist in the actual rates of ADHD diagnoses (Centers for Disease Control and Prevention, 2013). Sharp increases in the overall national rates of ADHD diagnoses (11% for 2011–2012) have added new fuel to long-standing concerns of possible overtreatment (e.g., Schwarz, 2013). Although difficult to determine with exactitude, as with any chronic disorder that has far-reaching consequences across educational, health care, and family domains, the economic impact of ADHD is considerable even by conservative calculations. Using the lower prevalence values offered by the literature and restricting their analysis

to mental health and educational costs, Pelham, Foster, and Robb (2007) estimated annual aggregate costs associated with the management of ADHD in children and adolescents in the United States at \$42.5 billion.

ADHD frequently co-occurs with a variety of neurodevelopmental and socioemotional behavioral disorders, and the symptoms of other disorders can mimic the symptoms of ADHD, making differential diagnosis and the identification of comorbidity essential to effective management of the disorder (Barkley, 2006; Brock, Jimerson, & Hansen, 2009; Brown, 2000). Thus, the most common presentation of ADHD is ADHD comorbid with another disorder, with only one third of all clinical cases representing noncomorbid or pure ADHD (cf. Brown, 2000). Among the disorders reported to commonly co-occur within study samples of ADHD has been LI (Cohen, Barwick, Horodezky, Vallance, & Im, 1998; Sciberras et al., 2014; Tirosh & Cohen, 1998).

Language impairment (LI) represents another highly prevalent neurodevelopmental disorder with similarly far-reaching academic, social, and vocational sequelae, whereas ADHD typically co-occurs with other conditions, the most common presentation found in epidemiological samples of LI has been a profile of specific LI (SLI), accounting for approximately two thirds of affected cases (Johnson et al., 1999; Tomblin et al., 1997). Representing roughly 7% of the student population, individuals with SLI present with diminished linguistic proficiencies in the absence of significant

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limitations in hearing acuity, cognitive development, or socioemotional development. Another important contrast between ADHD and SLI is that whereas ADHD enjoys global recognition and benefits from substantial clinical and research supports, the terms LI and SLI have gone largely unrecognized outside of the research literature and SLI represents a demonstrably under-resourced clinical entity (Bishop, 2010). Longitudinal studies indicate further that the risk of undertreatment rather than overtreatment is more likely for individuals with SLI because the majority of participants did not receive intervention during their academic careers (cf. Tomblin, 2014).

In this research forum article, the potential impact that ADHD can have on the identification, assessment, treatment, and study of SLI is considered from four different vantage points. First, as a contrasting clinical designation, ADHD provides a useful validity test for the development of clinical markers of SLI and vice versa. Measurements of children's linguistic abilities, ideally, would not confuse underlying psycholinguistic deficits with poor test performances that are due to nonlinguistic weaknesses in sustained attention, working memory, or planning and organization. Most standardized language tests have not been designed around the need to differentially diagnose. Also, many pediatric psychiatric measures contain items that would penalize individuals with LI (Redmond, 2002; Webster, Brown-Triolo, & Griffith, 1999). Some key measures appear to be suitable to the task.

The impact of ADHD on LI can also be considered at the level of individual profiles. Practitioners are regularly faced with the challenges of accommodating for ADHD comorbidity on their caseloads (American Speech-Language-Hearing Association, 2008), so the extent to which the presence of attention deficits interacts with children's LI by making them more severe or in other ways different than children who do not have ADHD informs clinical practice and contributes to theory building (see Tomblin & Mueller, 2012, for a discussion). Consideration of the possibility that co-occurring ADHD and LI might represent additive or interactive disorders is best addressed by using those measures shown to be robust at differentiating cases of ADHD from LI.

An additional way the study of ADHD can potentially inform theoretical accounts is by providing investigations with important cross-etiology comparisons. Group comparisons between children with SLI and children with typical development (TD) represent the primary source for testing theories about the nature of this disorder (cf. Leonard, 2014), and these comparisons have allowed some accounts to be falsified. However, information based solely on contrasting SLI with TD is incomplete. To test the necessity or sufficiency of any proposed nonlinguistic contributor to the etiology of SLI (e.g., deficits in processing speed, temporal processing, working memory, and implicit learning) comparisons between clinical groups are preferred for a variety of reasons. Direct comparisons between study groups of ADHD and SLI have been in short supply, but the available studies provide very little support for a connection

between nonlinguistic deficits found in ADHD and children's language abilities.

The impact of ADHD on LI can be considered within a larger public health context. Because of the heightened surveillance of children's behavioral difficulties by teachers and other referral sources, individuals with ADHD+LI comorbidity might be benefiting from preferential access to speech-language services relative to individuals with SLI.

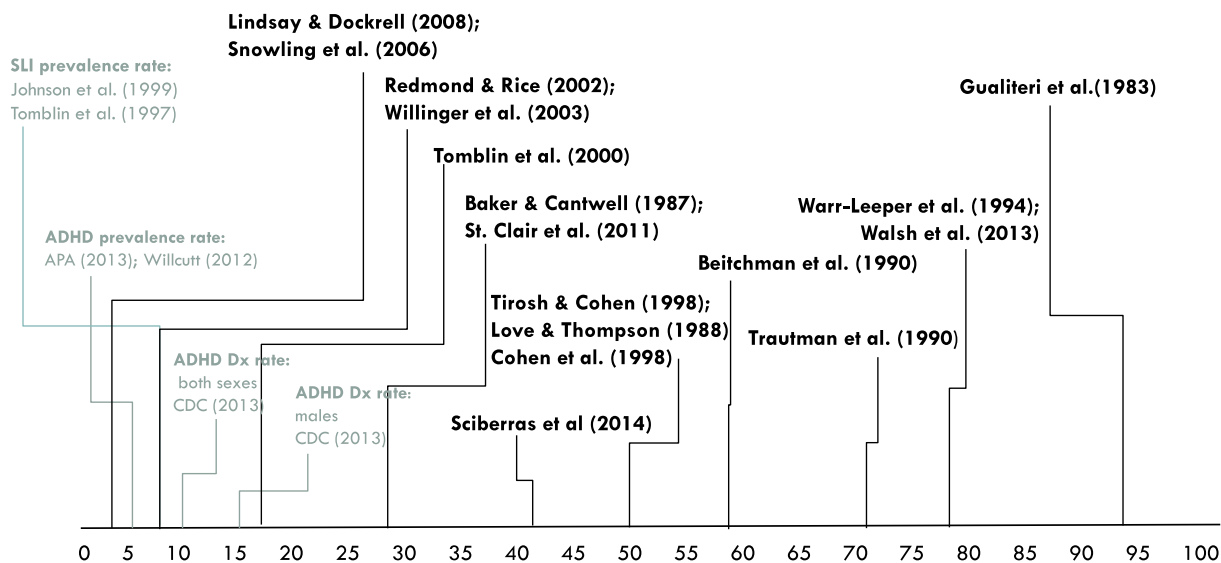
## The Construct Validity of Clinical Indices

It seems a fairly straightforward proposition to gather the available research reports on the rates of comorbid ADHD and LI from both clinically and community-sourced study samples and use this collection to arrive at a reasonable estimate of the expected co-occurrence rate. We would naturally expect some variation across reports, but we should also expect rates to cluster around a reasonable range providing a consensus view. However, as Figure 1 illustrates, co-occurrence rates of ADHD and LI have been remarkably unstable with attested values more or less evenly distributed across the possible range. The resulting situation is theoretically generous in the sense that any model of ADHD and LI linkages could find some support in this literature. This includes the supposition that overlap between the two disorders is due to spurious comorbidity because these designations essentially represent the same disorder (e.g., Gualtieri, Koriath, Van Bourgondien, & Saleeby, 1983), as well as the incompatible possibility that the appearance of ADHD in cases of LI is not demonstrably different than it is in the general population (e.g., Lindsay & Dockrell, 2008; Snowling, Bishop, Sothard, Chipchase, & Caplan, 2006).

Cross-signals regarding the expected co-occurrence rates of attention deficits and LI might be due to several methodological factors. Variation in ascertainment and recruitment procedures, eligibility criteria, the age of the participants, or the extent to which confounds were controlled (e.g., low nonverbal IQ and bilingual status) probably contributed to inconsistent findings. However, a more fundamental issue needs to be addressed before we can begin to untangle the empirical record. Co-occurrence rates are meaningless if the clinical indices used cannot be trusted to differentiate between the disorders under consideration. Many popular measures are unsuitable because they are incapable of reliably differentiating typical from atypical status. Furthermore, measures that might be reasonably good at distinguishing typical from atypical performance may not be capable of differentiating between clinical groups. Which measures of ADHD and LI can be trusted to control for artifactual comorbidity?

Clinical designations represent evolving constructs, and as such, the boundaries between disorders regularly undergo revision as new information accumulates, which has happened with the boundary between ADHD and LI. Older versions of the *Diagnostic and Statistical Manual of Mental Disorders (DSM)* framework allowed for the diagnosis of situational ADHD, or the presence of core symptoms in either academic or nonacademic settings, but did

**Figure 1.** Reported co-occurrence rates for attention-deficit/hyperactivity and language impairment. SLI = specific language impairment; ADHD = attention-deficit/hyperactivity disorder.



not require both (American Psychiatric Association, 1987). This would allow for an individual with LI to have a version of ADHD that is primarily operative at school during verbally demanding situations. Later versions stipulated that “at least some ADHD symptoms need to be present in two or more settings” (American Psychiatric Association, 1994, p. 84), which represents a modicum of correspondence across academic and nonacademic settings. The current *DSM-5* scheme now requires ADHD symptoms to be present in nonacademic settings. Reflected in the new guidelines is recognition that some individuals with specific learning or developmental disorders may appear to have ADHD because of frustration, lack of interest, or limited ability when they are in academic settings that are not appropriate for their developmental level. However, this would no longer be considered ADHD in the current framework unless those symptoms also appeared outside of classroom contexts (American Psychiatric Association, 2013, p. 64). Most of the literature on ADHD+LI comorbidity has been based on older *DSM* frameworks.

There are no diagnostically validated behavioral measures of ADHD (cf. Barkley, 2006). Moderate effect sizes, low specificity, and inadequate reliability associated with neuropsychological indices of attention and executive function continue to compromise their applicability to differential diagnosis of ADHD (Nigg, Willcutt, Doyle, & Sonuga-Barke, 2005; Riccio, Reynolds, & Lowe, 2001; Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005; Willoughby & Blair, 2011; Zelnik, Bennett-Back, Miari, Goetz, & Fattal-Valevski, 2012). In their review, Riccio et al. (2001) noted that virtually any disorder of childhood, including, but not restricted to, intellectual deficit, affective disorder, conduct disorder, sleep disorder, learning disability, maltreatment, low birth weight, hearing impairment,

is a candidate for producing deficits in vigilance, sustained attention, and impulsive responding. These authors concluded that “reliance on these measures will result in an unacceptably high number of false positive errors (i.e., over diagnosis of ADHD)” (Riccio et al., 2001, p. 232). The risk for overidentification of ADHD by using these measures appears to be particularly applicable to SLI. Rielly, Cunningham, Richards, Eldbard, and Mahoney (1999) examined the extent to which a standardized executive function task could reliably differentiate cases of SLI from cases of co-occurring ADHD+LI and reported an 81% false-positive rate. When these limitations are taken under consideration, reports of sustained attention deficits associated with SLI relative to typically developing controls (e.g., Finneran, Francis, & Leonard, 2009; Spaulding, Plante, & Vance, 2008) turn out to be not particularly illuminating.

Standardized rating scales that ask informants to endorse and indicate the severity of clinical symptoms feature prominently in the identification, diagnosis, treatment, and study of ADHD. Ratings provided by parents are particularly informative because parents have access to their children’s behavior across a variety of contexts and for extended periods of time. Parent ratings of ADHD symptoms would be preferred over teacher ratings for students with SLI for other reasons. Although 90% agreement between parent and teacher assignment of ADHD status can be expected when parent ratings are positive (see Biederman, Keenan, & Faraone, 1990), overall levels of concordance between parent and teacher ratings have consistently been modest ( $r < .30$ ; cf. Barkley, 2006), suggesting that teachers tend to overidentify symptoms that are specific to the academic context. Teacher ratings have also shown low levels of agreement with observational measures of ADHD symptoms (e.g., Schachar, Sandberg, & Rutter, 1986) and

with ratings provided by other teachers (Barkley, 2006; Redmond & Rice, 2001). When used to examine potential genetic contributors to ADHD, heritability estimates based on teacher ratings have been considerably lower than those based on parent ratings (Merwood et al., 2013).

Teacher ratings of behavior within academic settings have figured prominently in signals of elevated co-occurrence of ADHD in LI study samples (e.g., Baker & Cantwell, 1987; Beitchman, Hood, & Inglis, 1990; Lindsay, Dockrell, & Strand, 2007; Mueller & Tomblin, 2012; St. Clair, Pickles, Durkin, & Conti-Ramsden, 2011; Tomblin, Zhang, Buckwalter, & Catts 2000), whereas parent ratings have been associated with lower estimates (e.g., Lindsay & Dockrell, 2008; Redmond & Rice, 1998; 2002; Snowling et al., 2006). There is some direct evidence that children with SLI are particularly at risk for overidentification relative to other disorders when only teachers provide standardized ratings. Charach, Chen, Hogg-Johnson, and Schachar (2009) compared teacher ratings of ADHD symptoms in students representing a variety of developmental and learning disorders using the Conners' Teacher Rating Scale–Revised (Conners, 2004) against a reference standard of blinded *DSM-IV* psychiatric interviews. Correspondence was moderate-high for students with intellectual deficits or reading disabilities. In contrast, teachers provided twice as many false positives as true positives (19% vs. 9%) for the participants with SLI. This suggests that overidentification of ADHD symptoms was not necessarily a general property of the Conners' Teacher Rating Scale–Revised, but rather the clinical measure was particularly vulnerable to misattribution in cases of SLI.

Although parent ratings represent a stronger choice for evaluating ADHD status in individuals with known or suspected SLI, the potential for overlapping symptoms is still present. Redmond (2002) reviewed the content of several standardized socioemotional behavioral rating scales and found that all of them contained language and academic items (e.g., *won't talk*, *speech problems*, *poor school work*, *does not seem to listen to what is being said to him/her*, *difficulty doing or completing homework*, and *spelling is poor*) and recommended that these items be removed when scales are used to assess children with LI. Redmond and Rice (1998) examined the consequences of removing language and academic ratings from the parent and teacher ratings of children with SLI and children with TD and found that after this adjustment observed group differences became nonsignificant across most of the syndrome scales. However, one potential risk with removing items from standardized rating scales is that it might compromise their capacity to identify ADHD. Redmond and Ash (2014) addressed this concern by comparing the impact of removing language and academic items from the Conners' Parent Rating Scale–Revised (Conners, 2004) and the Child Behavior Checklist (Achenbach & Rescorla, 2001) on the capacity of these instruments to discriminate ADHD from TD and ADHD from SLI. The results of receiver operating characteristic curves indicated that removing these items had very little impact on the discrimination between ADHD and

TD but improved diagnostic precision with the ADHD and SLI contrast. Another key finding from this report was that significant differences were found between the groups of children with ADHD and the children with TD on 26 of the 27 subscales examined, consistent with the consensus view that ADHD is associated with a complex profile of socioemotional behavioral difficulties. In contrast, differences between the children with SLI and TD were primarily restricted to those scales measuring peer difficulties and clinical areas that could reflect underlying receptive language difficulties (inattention).

In a similar fashion, the set of measures available to practitioners for assessing children's language abilities consists of both good and poor choices for differential diagnosis of ADHD and LI and the identification of comorbidity. Spaulding, Plante, and Farinella (2006) used information provided in language test manuals and found that on some of the most commonly used tests, children with LI can be expected to perform within normal limits. Vocabulary tests were particularly poor at differentiating cases of LI from cases of TD (see also Gray, Plante, Vance, & Henrichsen, 1999), whereas tests that incorporated measurement of grammatical skills and/or verbal memory performed considerably better.

A prominent line of research suggests that more targeted measures of tense marking, nonword repetition, and sentence recall represent particularly good candidates for clinical markers of SLI (see Pawlowska, 2014, for a review). In one of the few studies using conversational indices to examine the linguistic abilities of young children with ADHD (age range: 5–8 years), Redmond (2004) found essentially identical levels of performance between the participants with ADHD and the typically developing controls in their overall accuracies with tense marking (97% vs. 98%), and both were significantly better than the participants with SLI (79%). Oram, Fine, Okamoto, and Tannock (1999) reported that their study sample of children with ADHD performed within normal limits on a standardized sentence recall measures (age range: 7–11 years). In more recent times, Redmond, Thompson, and Goldstein (2011) examined the extent to which tense marking, nonword repetition, and sentence recall, as well as a standardized measure of children's narrative abilities, could be used to differentiate cases of SLI from cases of ADHD (age range: 7–8 years). Results indicated that children with ADHD performed similarly to the TD controls, and observed levels of diagnostic accuracy across all four measures were high for differentiating SLI from ADHD (areas under the receiver operating characteristic curve ranged from .875 to .963). Parigger (2012) replicated the results of Redmond et al. (2011) with measures collected on a sample of Dutch-speaking children.

In sum, a preliminary but encouraging body of research suggests that within the framework provided by the current *DSM-5*, key distinctions demarcate the respective phenotypes of ADHD and SLI. These differences have the potential to guide differential diagnosis and the identification of comorbidity. They also provide a useful benchmark from which to examine potential additive and interactive

effects associated with comorbidity of these two disorders. Future research may yield additional markers for younger and older groups, but parent ratings of ADHD symptoms adjusted for overlapping language symptoms and children's performances on tense marking, nonword repetition, and sentence recall measures presently represent the best guards against artifactual comorbidity in young elementary students. Thus, these measures represent good choices for examining further the potential impact of co-occurring ADHD on children's LI.

### Impact of Co-Occurring ADHD on LI

The presence of different co-occurring disorders can affect children's LIs in different ways. For example, on measures of tense marking children with LI and co-occurring deficits in nonverbal IQ (sometimes referred to in the literature as nonspecific LI or NLI) have been shown to perform at significantly lower levels and to develop in this area more slowly than children with SLI (Rice, Tomblin, Hoffman, Richman, & Marquis, 2004). Similar advantages favoring study participants with SLI over those with NLI have been reported for standardized language tests and narrative measures but interestingly did not appear on expository tasks (Nippold, Mansfield, Billow, & Tomblin, 2008; Wetherell, Botting, & Conti-Ramsden, 2007). For individuals with NLI, the coexistence of nonverbal deficits increases their risk for developing socioemotional behavioral difficulties, including ADHD (Elbro, Dalby, & Maarjberg, 2011; Law, Rush, Schoon, & Parsons, 2009; Snowling et al., 2006) and reading difficulties (Bishop & Adams, 1990; Catts, Fey, Tomblin, & Zhang, 2002). Children with NLI appear to be relatively less responsive to interventions targeting reading skills than children with SLI (Bowyer-Crane, Snowling, Duff, & Hulme, 2011), and there is also some evidence that children with SLI and NLI respond differentially to language intervention strategies (Goorhuis-Brouwer & Knijff, 2002). Other studies have reported similar language gains between SLI and NLI participants when a common language treatment was provided (Bowyer-Crane et al., 2011; Cole, Dale, & Mills, 1990; Fey, Long, & Cleave, 1994). However, the presence of small study samples and moderate treatment effects prevents a definitive synthesis. Additional investigations are needed to more clearly delineate the impact of low nonverbal abilities on children's responses to interventions.

In contrast to the impact associated with the co-occurrence of nonverbal deficits, another line of research examining a different comorbidity suggests that when LI and reading disability (RD) co-occur, they represent non-additive and noninteractive comorbid disorders (Bishop, McDonald, Bird, & Hayiou-Thomas, 2009; Catts, Adlof, Hogan, & Ellis Weismer, 2005). In these studies, children with LI who have co-occurring reading deficits did not present with more severe LI (as indexed by tense marking, nonword repetition, and omnibus language measures) than affected children who did not have reading deficits, nor did cases of LI+RD have reading deficits that exceeded levels presented by children with RD only.

Does ADHD affect children's LI in a way that is similar to deficits in nonverbal IQ or in a way that is more similar to RD? Information on this question is limited. Redmond, Ash, and Hogan (2015) administered measures of tense marking, nonword repetition, and sentence recall to children with SLI, ADHD+LI, and TD. The results indicated that performance levels associated with the SLI and ADHD+LI groups were very similar, indicating that ADHD had no independent detrimental impact on children's LI. An unexpected modest positive correlation was found between the severity of participants' ADHD symptoms and their sentence recall performance, suggesting a tendency for participants with higher levels of ADHD symptoms to perform better than those with lower levels. Thus, rather than additive or interactive effects that would suggest the presence of a more severe double deficit or an ADHD+LI subtype that is substantially different from SLI, a limited subtractive and protective effect was associated with elevated ADHD symptoms. Additional research is needed to determine whether this finding is spurious, but the possibility that some aspect of having ADHD offsets risk for children with LI warrants additional investigation. Perhaps the advantage appears because children with comorbid ADHD+LI are more inclined to receive services than children with SLI or receive services earlier and/or for longer durations because of the saliency of their socio-emotional behavioral difficulties.

### The Value of Cross-Etiology Comparisons

A study by Cardy, Tannock, Johnson, and Johnson (2010) is illustrative of the potential of cross-etiology comparisons to test theoretical assumptions. Several investigators have proposed links between the linguistic deficits associated with SLI and observed limitations in affected individuals' processing speed and rapid temporal processing (e.g., Benasich, Thomas, Choudhury, & Leppanen, 2001; Kail, 1994; Montgomery, 2005; Tallal, 2000; Windsor & Hwang, 1999). Cardy et al. (2010) examined the causal nature of these links more closely by administering two nonverbal speeded tasks and one auditory rapid temporal processing task to children with SLI, ADHD, and TD. Results indicated that children with ADHD performed more poorly than the children with SLI across all three tasks even though their language abilities were similar to the TD group. In a similar vein, Parigger (2012) examined the potential influence of children's performances across a battery of executive function tasks that have been implicated in ADHD on children's proficiencies with tense marking, nonword repetition, sentence recall, and narratives. No significant associations were found in any of the groups (SLI, ADHD, or TD). Other putative mechanisms for LI that would benefit from being similarly tested through SLI and ADHD comparisons include deficiencies in working memory, implicit learning, procedural memory, dichotic listening, central auditory processing, and sustained attention (cf. Barnes, Howard, Howard, Kenealy, & Vaidya, 2010; Gillam, Montgomery, & Gillam, 2009; Henry, Messer, & Nash, 2012; Hughes, Turkstra,

& Wulfeck, 2009; Hedenius et al., 2011; Nigg, 2006; Windsor & Kohnert, 2009).

In addition to testing causal hypotheses for common disorders, cross-etiology comparisons can be used to examine more closely the relative impacts that ADHD and SLI have on collateral areas of development. For example, both ADHD and SLI have been associated with negative peer experiences (Conti-Ramsden & Botting, 2004; Johnson et al., 2002; Weiner & Mak, 2009). To examine these relationships more closely, Redmond (2011) collected parental and self-reports of peer experiences from 7- to 8-year-old children with SLI, ADHD, and TD. The protocol included a self-report measure designed to identify children at risk for peer victimization (My Life in School Checklist; Sharp, Arora, Smith, & Whitney, 1994). The results of the My Life in School Checklist indicated 40% of the SLI group, 20% of the ADHD group, and 10% of the TD group reported experiencing elevated levels of physical bullying. The presence of buffering effects for number of close friendships provided by parental report was found for the ADHD and TD participants but not for the participants with SLI. This outcome was particularly interesting because parents of children with SLI reported that they had more close friends and spent more time with their friends than reports provided by the parents of the children with ADHD. This result suggests that a major contributor to the psychosocial health of individuals with SLI is not the number of close relationships they have but rather the extent to which they are targeted for bullying by some of their peers.

Cross-etiology comparisons contribute further to the study of SLI by providing important controls for potentially problematic confounds. For example, these clinical groups are probably more similar to each other than to groups of typically developing controls across key demographic variables (e.g., socioeconomic status, mother's education level, and nonverbal IQ; Redmond et al., 2011). Studies of SLI and ADHD often include comparison groups of unaffected children that are demonstrably above average in areas such as nonverbal IQ (cf. Frazier, Demaree, & Youngstrom, 2004; Gallinat & Spaulding, 2014), advantages that distort results and exaggerate the influence of subclinical or low average scores on affected children's performances. Cross-etiology comparisons would provide investigations of SLI with additional adjustments beyond demographic variables. For example, some aspects of living with an LI represent common experiences in families dealing with neurodevelopmental or learning disorders. This includes both the positive and potentially negative aspects of receiving clinical services. It also includes regular episodes of academic failure, peer neglect, and peer victimization and the socioemotional fallout associated with these chronic stressors (Barkley, 2006; Tomblin, 2014). Another important consideration is the potential influence on ascertainment that is brought in by differences between study groups in their motivation to participate in research studies. Families of children with disabilities, such as SLI and ADHD, are likely influenced by perceptions of potential benefits of participating because they are in crisis, need additional information, or want a

second opinion. Families of children developing typically are probably more motivated out of curiosity, have a general interest in child development, or are moved by a sense of civic duty.

## ADHD as Potential Contributor to Educational and Health Disparities

Epidemiological studies of ADHD have appeared with regularity over the last 20 years, and the information available reflects a diversity of regional and international study samples (Willcutt, 2012). The diagnosis rate of ADHD in the United States is regularly monitored by the Centers for Disease Control and Prevention, providing the public with important information regarding historical and regional trends in service provision. In contrast, epidemiological samples of SLI have been few and far between, with the most recent studies initiated over 15 years ago. In this time span, significant changes have taken place in key areas of clinical science, educational policy, and service provision. The extent to which identification rates of cases of SLI have improved or worsened over this time period is unknown and, given available resources, unknowable. Reports from the U.S. Department of Education, by the American Speech-Language-Hearing Association, or other organizations that provide the public with annual census data on the number of students receiving services from speech-language pathologists are unsuitable because these do not differentiate between speech, voice, and language disorders, nor do they disaggregate students with SLI from those with concomitant disorders.

Current information on treatment rates of SLI, ironically, is more accessible from reports of ADHD. Sciberras et al. (2014) examined the rate at which LI appeared in cases of ADHD (ages 6–8 years) within a large Australian community-ascertained sample ( $n = 3,734$ ). LI status was determined by using the Clinical Evaluation of Language Fundamentals–Fourth Edition Screening Test (Semel, Wiig, & Secord, 2004). Significant differences were found between children identified through these procedures with ADHD+LI and the cases of SLI found within the control group in the relative rates at which families reported having ever accessed speech-language services (42% vs. 16%). The nature and duration of the services participants received was not further specified in the report. However, the discrepancy between the two groups is striking and corresponds to a 2.5-fold increase in the treatment rates for children with ADHD+LI relative to SLI. Levels of treatment associated with SLI in this sample were roughly consistent with those reported earlier in Zhang and Tomblin's (2000) U.S. kindergarten sample. The results of Sciberras et al. (2014) suggest that ADHD is a major contributor to educational and health disparities among individuals with LI.

## Concluding Remarks

The ADHD context is multifaceted and provides the management and study of SLI with both opportunities and

obstacles. Treating ADHD as a clinical test case provides opportunities to refine existing psycholinguistic protocols and to spur the development of more sophisticated theoretical accounts of SLI. The ADHD context also creates obstacles for the identification, assessment, treatment, and study of SLI. The default explanation for many teachers as to why some of their charges appear to be struggling academically or socially is to attribute these difficulties to underlying inattention, impulsivity, or hyperactivity. Unless more concerted efforts are made to raise public awareness of SLI and provide better training for referral sources on the ways in which LI can mimic ADHD symptoms in the classroom context, LI will likely continue to be overlooked. Online resources provided by the American Speech-Language-Hearing Association and the National Institute on Deafness and Other Communication Disorders, as well as the Raising Awareness of Language Learning Impairments campaign, represent steps in the right direction by presenting the public with general information about SLI and providing affirming vignettes of affected individuals and their families (American Speech-Language-Hearing Association, n.d.; National Institute on Deafness and Other Communication Disorders, 2011; RALLI campaign, 2012).

Despite its high prevalence and its demonstrated impact on the lives of affected individuals, SLI remains one of the most hidden neurodevelopmental disorders. The path forward will require an adjustment of values as much as additional empirical study of the links between ADHD and LI. As Tomblin (2014) concluded in his review of the longitudinal outcomes associated with the Iowa epidemiological study of SLI, empirical evidence can help inform policy decisions but only to the extent that we value the academic achievement and psychosocial welfare of those members of our communities with SLI.

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