Active Ingredients of Speech-Language Therapy in the Public Schools for Children with Language Impairment

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Abstract

An estimated 1.4 million children with LI receive speech-language therapy from SLPs in the public schools to mitigate the negative effects associated with LI. Much research has been conducted investigating the nature of LI as well as discrete aspects of intervention that may influence language gain. However, very little information exists specific to speech-language therapy in the public schools. As such, the current study had two primary aims: (a) to characterize speech-language therapy for children with LI, and (b) to determine the extent to which identified features of speech-language therapy predicted language gain over an academic year for children with LI. Detailed information was collected for 233 kindergarten, first, and second-grade children with LI who were receiving therapy from 73 SLPs in the public schools. SLPs chronicled discrete features of therapy for each of 10,819 therapy sessions experienced by these 233 participants in a business-as-usual framework. Additionally, SLPs video-taped five therapy sessions for each participating child; two video tapes were coded for the current study. Comprehensive descriptive analyses, latent profile analyses, exploratory factor analyses, and multiple regression models were used to address the study aims.

Findings from the current study inform theory, practice, and research for the field of speech-language pathology. Theoretically, study findings suggest that language therapy is beneficial to children with LI from a public service as well as a clinical
Children experienced average to high levels of emotional quality that may support children's feelings of support at school. Additionally, children in the current study made more than half of a standard deviation of gain over the academic year. However, some children made substantially more gains than others over an academic year, suggesting that therapy may have differential effects on children with LI. Additionally, therapy is theoretically intended to meet the diverse and individual needs of children with LI. Descriptive statistics of features of therapy suggest this is generally the case: much variability was seen for the majority of features. However, children with LI primarily received a traditional model of speech-language therapy (i.e., pull-out, small group, with other children who have IEPs) suggesting that factors other than children's needs may be driving service delivery models.

Practically, service delivery models are significantly associated with children's language. Regression analyses showed that children seen in large group settings (five to seven peers) made less than average gain than children who did not experience large group sessions. Additionally, children seen in therapy sessions with typically-developing peers gained more on average than children in therapy sessions without typically-developing peers. SLPs are encouraged to consider minimizing the size of group therapy sessions and to include typically-developing peers to those sessions. This study provides an initial investigation into business-as-usual therapy sessions for children with LI. To improve the long-term language outcomes for children with LI in the public schools, it is critical that SLPs incorporate evidence-based practice into speech-language therapy.
sessions and that researchers continue to investigate features of therapy that might function as active ingredients for children with LI.
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Chapter 1: Introduction

The purpose of the present study was to characterize speech-language therapy experiences for children with language impairment (LI) receiving services in the public schools and identify active ingredients influential to children's language growth. Children with LI are at significant risk for immediate and long-term deficits across a myriad of social and academic contexts (Clegg, Hollis, Mawhood, & Rutter, 2005; Justice, Bowles, Pence Turnbull, & Skibbe, 2009; Johnson, Beitchman, & Brownlie, 2010) and speech-language therapy may play a key role in altering the developmental trajectories for children with LI. However, very little is understood about how speech-language therapy is associated with changes in children's language. Literature within speech-language pathology has a strong empirical base for understanding the manifestations and implications of LI for elementary-age children (Conti-Ramsden, Crutchley, & Botting, 1997; Conti-Ramsden & Botting, 1999; Tomblin, Records, & Zhang, 1996; Tomblin, et al., 1997; Tomblin, Zhang, Buckwalter, and O'Brien, 2003) yet far fewer studies specific to therapy (see Cirrin & Gillam, 2008). As a result, speech-language pathologists (SLPs) must rely on child-level factors and professional judgment alone in making therapeutic decisions for this population. As an initial step in filling this research gap, this study investigates speech-language therapy in business-as-usual conditions to identify active
ingredients, or features of therapy, associated with language growth over an academic year.

The need for a larger empirical base specific to speech-language therapy is indicated for several reasons. For one, the American Speech-Language Hearing Association (ASHA, 2005) put forth a position paper emphasizing the need for all SLPs to implement an evidence-based practice (EBP) framework in making clinical decisions. This framework calls for an integration of professional experience, client needs, and high-quality empirical evidence as a way to systematize clinical processes (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). Without an extensive body of such evidence, SLPs are unable to fully participate in EBP. Second, the Individuals with Disabilities Education Act (IDEA, 2004) mandates that all children receive specialized education services pertinent to their individual needs and reflecting a plan intended to shape their growth over time. Finally, SLPs serving children in the public schools are not only responsible for addressing and shaping language trajectories for children with LI, but ensuring that treatment aligns to educational standards, as outlined by the Common Core Curriculum (Common Core, 2010). In these ways, SLPs are accountable professionally, legally, and educationally to bolster the language development of children with LI and as such, must have reliable resources from which to make well-informed treatment decisions.

Identification of effective treatment practices may be especially significant for children with LI. Although SLPs are responsible for treating children with a range of
disorders (ASHA, 2010b), children with LI represent one of the most prevalent groups on their caseloads, representing over 1.4 million children across the United States (US Department of Education, 2010). However, children with LI are a heterogeneous population (Conti-Ramsden & Botting, 1999; Conti-Ramsden et al., 1997) and as such, present a challenge for SLPs and researchers trying to systematically identify - and subsequently treat - this group of children. Children with LI manifest with impaired communication compared to that of their typically-developing, age-matched peers (Tomblin, et al., 1996); however, their presentation of deficit areas may be quite varied (Bishop & Edmundson, 1987; Spauling, 2012). According to Conti-Ramsden et al. (1997) children with LI may fall within one of six different profiles, ranging from one affected area of language (e.g., morphosyntax) to deficits across all possible domains and modalities.

Researchers tend to use a combination of cut-off scores and exclusionary criteria to identify children with LI. Although a range of scores has been suggested (Aram, Morris, & Hall, 1993; Records & Tomblin, 1994), Tomblin et al., (1996) suggest a cut off score of -1.25 $SD$ on two or more indices of language. Exclusionary criteria may then be applied to differentiate children within LI. Children without any other diagnoses are considered to have a primary language impairment; those who test within normal limits on measures of cognition are characterized as having specific-language impairment (SLI) whereas those with below-average cognitive abilities ($< 85$) have nonverbal language impairment (NLI). In contrast, children for whom the language deficit is secondary to
other known diagnoses (e.g., hearing loss, autism) are considered to have a secondary language impairment. These distinctions are important in clinical-based research for researchers and clinicians alike to understand which populations are involved and how results might generalize to the larger population of children with LI. For the present study, I am interested in capturing business-as-usual indices of speech-language therapy in the public schools. As SLPs serve the broad spectrum of children with LI, I conceptualize children with LI as those with primary or secondary LI.

Beyond use of norm-referenced measures as indicators of LI status, SLPs must also consider functional performance within an educational setting in determining whether children qualify for services (ASHA, 2010b, IDEA, 2004). Language can be conceptualized along a continuum from oral to literate, with oral language skills utilized for more social contexts and literate for more academic functions (Snow, 2010). As children enter school, language demands begin to shift from the oral to literate end of the continuum, and children with LI often have not mastered oral language skills sufficiently to support development for more literate tasks. In school, children are asked to follow multiple step directions, synthesize orally-presented information, answer questions, and participate in discussions. Children with LI may struggle with these tasks, which places them at risk not only for continued impairments in language, but subsequent deficits academically (Bishop & Adams, 1990; Catts & Kamhi, 1999; Catts, Fey, Tomblin, Zhang, 2002; Justice et al., 2009; Scarborough, 1990; Skibbe et al., 2008). Most strikingly, researchers suggest that children with LI are less likely to outgrow LI (Law,
Tomblin, & Zhang, 2008) and are at risk for experiencing persistent academic lags secondary to LI (Fey, Catts, Proctor-Williams, Tomblin, & Zhang, 2004; Stothard, Snowling, Bishop, Chipcase, & Kaplan, 1998) even with provision of therapy services (Conti-Ramsden, Botting, Simkin, & Knox, 2001). These risks often impact advanced education and employment opportunities in adulthood (Johnson et al., 2010).

Given the prevalence of LI within public schools in the US, the heterogeneity of LI, the long-term risks associated with LI, and the probability of persisting impacts into adulthood, understanding factors associated with language growth is critical for this population. A body of work in speech-language research suggests that speech-language therapy indeed has a positive effect on children's language gains (e.g., Leonard, Camarata, Pawlowska, Brown, & Camarata, 2006; Throneburg, Calvert, Sturm, Paramboukas, & Paul, 2000; Tyler, Lewis, Haskill, & Tolbert, 2003; van Kleeck, Gillam, & McFadden, 1998). A meta-analysis by Nye, Foster, and Seaman (1987) sampled 43 treatment studies which indicated that, overall, speech-language therapy had an average effect size of 1.04 relative to changes in children's language. More recent studies indicate that children in treatment conditions outperform peers with similar impairments who did not receive speech-language therapy (Tyler et al., 2003; van Kleeck, et al., 1998). However, none of these studies provide sufficient information to discern the active ingredients, or locus of change, of therapy, as most of the studies were conducted in lab facilities, with researchers administering the treatment under tightly controlled conditions. This lack of external validity raises many questions as to the feasibility and
utility of such treatment programs in speech-language therapy sessions in the public schools.

Although these studies do not allow for identification of the active ingredients in speech-language therapy, the evidence from treatment research specific to children with LI as well as related disciplines does provide evidence of various features of speech-language therapy that may function as active ingredients in therapy settings. Whether or not these features are related to children's outcomes is an empirical question and a primary aim of this study. Based on treatment studies to date, I consider the unique and interactive contribution of eight features of speech-language therapy that may serve as active ingredients for children with LI. These features include:

- **Service Delivery Methods**: The setting, grouping, and collaboration characteristics of the provision of speech-language therapy (Beck & Dennis, 1997; McGregor, 2000; Throneburg et al., 2000; Wilcox, Kouri, & Caswell, 1991)

- **Materials**: The supplies the SLP uses within a speech-language therapy session (Carr & Felce, 1997; Crain-Thoreson & Dale, 1992; Ukrainetz, 1998)

- **Direction**: Who is leading the speech-language therapy interactions at a given moment (Connor, Morrison, & Slominski, 2006; Girolametto, Weitzman, van Lieshout, & Dufff, 2000; Girolametto, Weitzman, & Wiigs, 2003)
• Targets: The area of language being addressed during therapy (Gierut, 1998; Leonard, Camarata, Pawlowska, Brown, & Camarata, 2008; Tyler & Sandoval, 1994)

• Techniques: The therapy strategies a SLP uses during therapy to address language targets (Bradshaw, Hoffman, & Norris, 1998; Hassink & Leonard, 2010; Yoder, Spruytenburg, Edwards, & Davies, 1995; Yoder & Stone, 2006).

• Frequency: The total amount of therapy time experienced over an academic year (Baker & McLeod, 2011; Bellon-Harn, 2012; Fey, Cleave, & Long, 1997; Law, Garrett, & Nye, 2004; McGinty, Breit-Smith, Fan, Justice, & Kaderavek, 2011; Mullen & Schooling, 2010; Nye et al., 1987; Proctor-Williams & Fey, 2007; Ukrainetz, Ross, and Harm, 2009)

• Instructional Quality: The quality of language instruction and feedback children receive during therapy (Burchinal et al., 2008; Curby et al., 2009)

• Emotional Quality: The quality of the emotional warmth, care, and concern experienced within the therapy environment (Horvath & Symonds, 1991; Rudasill, Rimm-Kaufman, Justice, Pence, 2006; Schmitt, Pentimonti, & Justice, 2012)

Given the importance of language speech-language therapy for children with LI and the limited treatment research specific to school-based, speech-language therapy, this study has two primary research aims: (a) to characterize speech-language therapy in the public schools for children with LI, and (b) to determine the extent to which features of
speech-language therapy independently and interactively predict children's language gain over an academic year. In order to address these study questions, direct and indirect information will be utilized from 73 SLPs and 233 kindergarten and first grade children with LI currently receiving speech-language therapy in the public schools. Information will be gathered in a business-as-usual framework to capture authentic aspects of speech-language therapy for children with LI. Within this document, a thorough review of the literature is presented, followed by a detailed methods section that outlines SLP and child-level demographics, participant recruitment processes, measures used in analyses, as well as an analytic plan for answering the study questions. Next, the results section details all study findings and finally, the discussion section presents an interpretation of findings relevant for SLPs in the public schools as well as researchers vested in applied, clinically-based research specific to children with LI.
Chapter 2: Review of Literature

In the current era emphasizing evidence-based practice and accountability for children's outcomes in the public schools, the lack of empirical research specific to the effectiveness of speech-language therapy for children with LI is concerning. For children in the primary grades, language skills are important to all aspects of life, including peer relations (Clegg et al., 2005), academic proficiency (Justice et al., 2009; Skibbe et al., 2008), and future employment opportunities (Johnson et al., 2010), and children with LI are at significant risk for difficulties in all of these areas. As a professional community, speech-language pathologists (SLPs) serve children with LI in an attempt to eradicate the impairment and to mitigate long-term impacts; however, due to the scant literature-base to guide their therapy efforts (see Cirrin & Gillam, 2008), SLPs are left to make decisions about children's speech-language therapy utilizing professional experience and child factors alone. This state of the evidence supporting professionals’ decisions is insufficient; researchers must respond with concerted focus on clinical research aimed at understanding critical features, or active ingredients, of speech-language therapy and how these ingredients influence growth. For the purposes of this study, I conceptualize active ingredients as malleable, measurable aspects of speech-language therapy that explain significant amounts of variance in children’s language growth over time, either directly or indirectly.
In 2005, ASHA published a position statement on evidence-based practice, calling for SLPs to utilize evidence-based principles when planning speech-language therapy in an effort to support high-quality care. Evidence-based practice (EBP), which originated in the medical field (see Sackett et al., 1996) came about in response to concerns that clinicians were a-systematic in decision-making approaches. EBP provides a framework in which professionals are expected to integrate experience, knowledge of client's needs, and evidence from high-quality studies to implement empirically-validated and appropriate therapy. Although the notion of EBP has strong theoretical appeal, there are remarkably few empirical studies that can guide clinical decision-making with respect to speech-language therapy practices in the public schools (Gillam & Gillam, 2006). Cirrin and Gillam (2008), in a systematic review of speech-language therapy research pertaining to school-age children with LI, found little empirical evidence supporting effective speech-language therapy practices (i.e., only 21 studies that met criteria). Similarly, Cirrin et al. (2010) conducted a systematic review of effective service delivery models in the public schools and found only five studies that met their criteria. As a result, Cirrin and Gillam (2008) and Cirrin et al. (2010) recommended that SLPs use their professional judgment and experience to guide their implementation of speech-language therapy for school-age children until a broader base of empirical work is available.

Indeed, professional experience and judgment are not to be dismissed. Nationally-certified SLPs must successfully complete a rigorous training program at an accredited university program, including 75 graduate credit hours specific to speech-language
pathology, 400 supervised practicum hours, achieve 70% or better on a national exam, and complete a 9-month internship (ASHA, 2009). Once certified, SLPs must maintain their certification by accruing 10 hours of continuing education on a yearly basis. However, even with such high qualifications, professional judgment alone is not adequate for driving effective treatment decisions. SLPs in the public schools are responsible for developing and implementing legally-binding individualized education plans (IEPs; IDEA, 2004) and ensuring that each plan is uniquely and individually designed to meet the communication needs of every child on their caseload (an average of 50; ASHA, 2010a). Most recently, SLPs are also responsible for providing speech-language therapy that aligns to the Common Core Standards (Common Core, 2010), which provide rigorous standards for language achievement for kindergarten through third grade. SLPs are not only legally responsible to children with LI, but are professionally obligated to conduct high-quality speech-language therapy (ASHA, 2010b) important for bolstering developmental language trajectories.

LI has significant implications for children, and as such, underscores the need for effective speech-language therapy. Establishing a larger empirical base governing effective speech-language therapy has the potential to impact therapy decisions of SLPs who serve children with LI, language growth for children with LI receiving speech-language therapy, and direction of future research specific to speech-language therapy for this population. The purpose of the present study is to rigorously examine a variety of potential active ingredients of speech-language therapy as experienced by children with
LI receiving speech-language therapy in the schools, and identify those that contribute to children’s language gains over time. To establish a rationale for the present study, this review is organized as follows: (a) First, the nature of LI is described, with attention to defining characteristics, identification, and prevalence of LI; (b) Second, the impacts of LI are addressed, with attention to educational and long term ramifications for children with LI; (c) Third, effectiveness of speech-language therapy is discussed utilizing evidence from longitudinal, empirical, and descriptive studies; (d) Fourth, potential active ingredients are identified and discussed, organized by structural, process, quality, and interactive aspects of therapy; (e) Finally, current study aims are presented.

Exploring the Nature of LI

Definition of LI. SLPs in the public schools serve children with a wide range of communication disorders, including language disorders, fluency disorders, speech sound disorders, dysphagia/swallowing disorders, voice disorders and those with severe-profound cognitive impairments (ASHA, 2007; ASHA, 2010a). Of these, one of the most prevalent types of disorder treated is that of LI, second only to speech sound disorders (ASHA, 2012). Children with LI, by definition, experience pronounced difficulties understanding and/or using language skills to communicate as compared to their peers of similar age and cultural background. Typically, this deficit is identified by children's significantly below-average performance on norm-referenced measures (Tomblin et al., 1996) coupled with consistent evidence showing functional impairments (Fey, 1986).
Children with LI are quite heterogeneous as a group with respect to the exact manifestation of the disorder. These children show individual differences specific to the impacts of the disorder on language modality (expressive, receptive; Bishop & Edmundson, 1987), severity (Spauling, 2012), and language domain (semantics, morphosyntax, phonology, or pragmatics; Conti-Ramsden et al., 1999), as well as the extent to which the disorder impacts children’s academic functioning (Cabell et al., 2010).

Much of the difficulties children with LI face in the classroom has to do with a “mismatch” between their current language abilities and the language required to participate fully in academic instruction. Language development can be conceptualized along a continuum from oral to literate forms, and children with LI may present with communication difficulties across the continuum (Snow, 2010). At the oral end of the continuum, children use fundamental aspects of communication to regulate their environment (requesting needs and wants; protesting undesirable activities) and engage in social interactions (greeting adults and peers, asking questions, entering pretend play scenarios). As children enter elementary school, the communication demands begin to shift toward the literate end of the continuum (Snow, 2010). Children are asked to use their language skills to engage in a variety of learning-related tasks, such as making predictions and evaluations of information heard, generating oral and written narratives, and comprehending reading passages, to provide a few examples. Often, children with LI demonstrate communication deficits at the oral end of the continuum upon school entry.
and consequently struggle to make the shift towards more literate forms. These challenges can be categorized across four main domains of language, including semantics, morphosyntax, phonology, and pragmatics.

Children presenting with deficits in *semantics* have an overall reduced lexicon compared to developmental expectations, characterized by deficits in both breadth and depth (McGregor, Oleson, Bahnsen, & Duff, in press), including a preponderance of high frequency words (i.e., more commonly used words; Adams, 2010), limited use of low frequency and academically relevant words (i.e., words used less frequently and more specific to academic content; Snow, 2010), and overuse of nonspecific terminology (e.g., "thing, stuff"; Wiig & Semel, 1994). The limited number of low frequency words and academically-relevant terms in their lexicon may pose difficulties both for oral communication needs (accurately and effectively communicating thoughts and ideas in a manner others can comprehend) and in literate communication situations (understanding content-specific terms; e.g., condensation and photosynthesis). Children with a diversity of more complex terms in their lexicon may be in better position to understand more complex text structures as well as instructional content that may use less common terms, and the absence of these semantic forms places children with LI at risk for later delays in reading and reading comprehension.

Children with difficulties in *morphosyntax* rely on simplistic sentence structure with few instances of complex syntax, such as noun and verb phrases (Bishop & Donlan, 2005) and struggle to comprehend such forms (Paul, 1990). They may present with
persisting grammatical errors, such as use of irregular past tense, prefixes, and suffixes, that not only make their speech sound immature (e.g., "Where he goed?") but will often impact written language (e.g., omitting word endings from their writing; Windsor, Scott, & Street, 2000).

Children with difficulties in phonology may have persisting articulation errors (e.g., s, r, l) and experience difficulty producing phonologically complex words and phrases (e.g., tongue twisters; Catts, 1986). Deficits in phonology may also present as reduced phonological awareness, an important precursor to reading (Catts, 1993; Larrivee & Catts, 1999). Finally, children may demonstrate delays in pragmatics, such as an inability to take appropriate turns or maintain the topic in conversation (Brinton, Fujiki, & Sonnenberg, 1988). They are more likely to experience communication breakdowns but less likely to either request clarification or make adjustments in their speech (Brinton et al., 1988).

As noted previous, children with LI may exhibit any combination of those problems described above, which makes this population of children very heterogenous in terms of the profile of difficulties they demonstrate. To better understand this heterogeneity, several researchers have attempted to determine whether there are empirically-based subgroups of children with LI. Conti-Ramsden et al., (1997), for instance, conducted an investigation of 242 7-year-old children attending classes for children with LI in the UK. These researchers explored profiles of children with LI based on their performance on five standardized tests of language skill. Six different profiles
were demonstrated by the data, with profiles conditional on the modality affected (expressive vs. receptive) and the areas of language affected (e.g., semantic, morphosyntactic, phonological, pragmatics). As an example, children comprising a profile described as a lexical-syntactic group experienced language difficulties specific to syntax, whereas children in the phonological-syntactic group experienced difficulties across all language areas except articulation. These profiles correspond to an earlier study by Rapin and Allen (1987) which also identified six subgroups in an attempt to disentangle the heterogeneity within LI.

These studies substantiate the notion of heterogeneity among children with LI, although follow-up work showed that these profiles are not very stable over time. Specifically, Conti-Ramsden and Botting (1999) investigated the stability of the profiles they identified in their 1997 study and found children with LI to be highly unstable in their presentation of affected language domains. Study findings showed that the specific profiles were relatively stable but that children changed profile membership over time. Forty-five percent of the children who were identified with one particular profile the first year were associated with a different profile at the time of follow-up. Such findings suggest that children with LI are not only heterogeneous as a group, but heterogeneous in individual profiles. The symptoms a child with LI presents with may change over time, suggesting the importance of continued assessment and speech-language therapy practices sensitive to such heterogeneity.
**Identification of LI.** Much of what we understand about children with LI stems from the work of Tomblin and colleagues, who conducted a large-scale epidemiological study from 1993 to 1995 to identify the prevalence, characteristics, and risks associated with LI. This study, conducted in the state of Iowa, followed approximately 2,000 children from kindergarten to second grade, and examined children’s performance across indices of language and literacy (see Fey et al., 2004; Law et al., 2008; Lubker & Tomblin, 1998; Shriberg, Tomblin, & McSweeney, 1999; Tomblin & Zhang, 2006; Tomblin et al., 1996; Tomblin et al., 1997). One of the hallmark studies from this work sought to establish consistent and reliable diagnostic criteria for identifying children with LI from a sample of 1,502 kindergarten students (Tomblin et al., 1996). Tomblin and colleagues employed rigorous methodology to ensure that their identification system achieved high sensitivity and specificity as compared to gold-standard, clinically-based judgments of children with LI. Results of their study suggested a diagnostic standard of $1.25 SD$ from the mean for two or more composite language subtests as an appropriate diagnostic indicator of LI.

Although the research community often utilizes the Tomlin et al. (1997) criteria for identifying children with LI, clinical practices for diagnosis appear to be more varied (see Aram, Morris, & Hall, 1993). Clinically, identification of LI is a multi-faceted process with considerable variation in the use and application of cut-off scores for differentiating impaired from non-impaired language skill. According to ASHA (2004), language assessments should include considerations above and beyond that of a child’s
performance on a norm-referenced test, to include identification of a child’s underlying strengths and weaknesses, the impact of the impairment on everyday functioning, and environmental factors that might influence communication skills. In fact, students reading current textbooks within the field of communication disorders will find an emphasis on incorporating a battery of diagnostic tools in determining not only which children have LI, but who is in need of services. This battery might include use of norm-referenced tests, criterion-referenced measures (such as language samples), classroom observations, and stimulability for language change (Paul, 1995; Robertson, 2007). Given differences in the identification of LI by researchers (e.g., Tomblin et al., 1997) and clinicians, the latter of which involves consideration of many diverse sources of information, it is not surprising that there is limited congruence between researcher- and clinician-applied identification procedures. For instance, Aram et al. (1993) applied several researcher-designed diagnostic criteria to a sample of 252 children identified using clinical procedures as having LI, and found between 20 and 71% congruence between clinical and research-based systems of identification. Similarly, Stark and Tallal (1981) found that only 33% of 132 children clinically-diagnosed with LI met researcher standards for having LI.

Identification of children with LI within the public schools may be more complicated in that identification is informed not only by the procedures and decisions of the SLP but additional constituents and policies as well. IEP teams (i.e., collective body of professionals, administrators, and caregivers) in accordance with IDEA (2004) are
expected to incorporate assessment information, professional judgment of children's abilities compared to typically-developing peers, and district-established guidelines in determining eligibility for services. Historically, many districts have employed a discrepancy model (point differential between children's language and IQ) for determining eligibility; however, ASHA (2004) encouraged SLPs to move away from using discrepancy formulas as a sole indicator of children's language needs. Nonetheless, many districts continue to employ cut-off criteria (specific score on norm-referenced tests) as part of the eligibility criteria, ranging from 1 SD below the mean to 2 SD below the mean (Turnball, Turnball, Shank, Smith, & Leal, 2002). As such, while the term LI may be used consistently among researchers and clinicians, the populations may be distinctly different. Differential diagnostic criteria impacts interpretation and generalization of researcher-based speech-language therapy studies to clinically-identified samples and highlights the need for ecologically-valid speech-language therapy studies (i.e., studies conducted in a child's natural environment, such as school-based therapy sessions) of children with LI in elementary school settings.

**Prevalence of LI.** Given the differential schemes that are used to identify children exhibiting LI, it can be somewhat difficult to estimate the prevalence of LI, given that some estimates are based on researcher-based criteria whereas others are based on clinician-based criteria. At the same time, prevalence estimates are complicated by variations in whether estimates are specific to a subset of children with LI (e.g., those with LI and no comorbidities) or a more general population of children with LI. With
respect to the former, Tomblin and colleagues' epidemiological study specifically focused on children with specific language impairment (SLI), representing children who exhibit LI in the absence of any significant cognitive difficulties or salient comorbidities. Tomblin, et al. (1997) reported a prevalence of SLI for kindergarten students of 7.4%, with a fairly even proportion of males and females represented (8% and 6%, respectively). While this represents a significant percentage of the population, children with SLI are but one subset of children with LI that SLPs serve in the public schools. Children with LI may also exhibit concomitant cognitive difficulties (i.e., cognitive ability < 85; Stark & Tallal, 1981; Tomblin et al., 2003), known as nonverbal language impairment (NLI), or with such comorbid diagnoses as autism, Down syndrome, and hearing loss (i.e., secondary language impairment). From a practice viewpoint, the U.S. Department of Education reports that over 1.4 million children in the United States are provided services for LI in the schools, representing 21% of all children served under IDEA (US Department of Education, 2010).

SLPs are charged not only with identification and diagnosis of children with both primary and secondary language impairment, but with treating these children within the public school system (ASHA, 2007). As such, for the purposes of this study, I conceptualize children with LI in a manner equitable to the current scope of practice for SLPs in the public school system: inclusion of children with both primary and secondary language impairments.
LI and Adverse Educational Impacts. The importance of accurate identification and treatment of children with LI is important for a variety of reasons, to include (a) the prevalence of these children within the population of school-children, and (b) the widespread impacts of this disorder on their general academic functioning. Indeed, a wealth of studies suggest that children entering school with persisting LI are at a distinct disadvantage compared to that of their peers. Children with LI tend to display less school readiness behaviors (e.g., following directions, working independently; Rimm-Kaufman, Pianta, Cox, 2000), weaker emergent literacy skills (e.g., print knowledge, phonological awareness; Skibbe, Justice, Zucker, McGinty, 2008), and weaker relationships with their teachers (Justice, Cottone, Mashburn, Rimm-Kaufman, 2008), all understood to be important predictors of language and literacy outcomes.

Such weakness place children with LI at significant risk for poor academic outcomes (Bishop & Adams, 1990; Catts & Kamhi, 1999; Catts et al., 2002; Justice et al., 2009; Scarborough, 1990; Vellutino et al., 1991; Skibbe et al., 2008). For example, Catts (1993) compared reading achievement for 56 kindergarten children with LI and 30 typically-developing peers. These children were tested in kindergarten, first grade, and second grade on measures of phonological awareness and reading achievement. Overall, children with LI achieved differential reading outcomes between kindergarten and second grade. Approximately 50% of children with LI were reading within normal limits; however, the other 50% fell behind their age-matched peers in word recognition and reading comprehension. Further, children's phonological awareness and rapid automatic
naming abilities accounted for 23-30% of the variance in reading outcomes after controlling for kindergarten language ability. Children with LI who presented with stronger phonological awareness and naming abilities in kindergarten outperformed children with LI with weaker skills. These results not only emphasize the impact of LI on educationally-relevant outcomes, but suggest the heterogeneity among students with LI. Those with LI were more likely to exhibit reading difficulties, but this was not uniform across the affected population.

To investigate this association between language and literacy with a larger population of children, Catts et al. (2002) studied 604 kindergarten students (328 with LI, 276 non-impaired) and followed their language and literacy trajectories through fourth grade. Their findings indicated that children who were diagnosed with LI in kindergarten were at greater risk for reading deficits in second and fourth grade than peers without LI. Of the 328 children with LI, approximately 54% met criteria for a reading disability in second grade; 50% met criteria in fourth grade. Additionally, Cabell et al. (2010) identified three emergent literacy profiles for 59 preschoolers with SLI (i.e., high, average, and low), even after controlling for children's expressive and receptive language skills, suggesting that children with LI vary not only in terms of language domain (Conti-Ramsden et al, 1997), but also in their associated difficulties with academic content areas.

Persisting LI may impact higher levels of language proficiency and academics, even once the more fundamental aspects of language have resolved (Fey et al., 2004; Stothard et al., 1998; Scarborough & Dobrich, 1990). A study by Fey et al. (2004)
investigated the oral and written narrative productions of 538 kindergarten students with and without LI across three time points. Results indicated that children with persisting LI in second and fourth grade had weaker narratives compared to their peers, across indices of microstructure and macrostructure. Stothard and colleagues (1998) found that even when immediate deficits associated with LI were remediated, challenges with academically-related language were likely to resurface in adolescence.

This may be especially concerning, given numerous studies suggesting the relative stability of LI diagnoses over time (Beitchman et al., 1994; Bishop & Edmundson, 1987; Conti-Ramsden et al., 1997; Conti-Ramsdem, Botting, Simkins, & Knox, 2001; Rice, Wexler, & Hershberger, 1998; Stark & Tallal, 1981; Tomblin et al., 2003). Across these studies, 21% to 92% of children with LI retained that diagnosis up to 7 years later. As an example, Tomblin et al. (2003) investigated 196 kindergarten children with LI who were currently not receiving services in the public schools. Their study found that 54% (n = 106) children maintained LI status two years later, and 52% maintained the diagnosis four years after the original diagnosis.

Furthermore, a longitudinal study by Johnson et al. (2010) suggests that LI has concerted impacts on children's lives well into adulthood. They followed 244 5-year-old children with and without LI until age 25. The children with LI at age 5 were significantly more likely to experience poor outcomes relative to education, communication abilities, and occupation at 25-years-old than their typical-developing peers. Only 14% of 24-26 year-olds with LI were enrolled in college courses (as
compared to 58% of control and 55% of speech-only); additionally, they were employed in fewer professional jobs than peers without histories of LI.

In summary, an overwhelming amount of evidence suggests that children with LI demonstrate weak skills across language and academic domains (e.g., Bishop & Adams, 1990; Fey et al., 2004) and are less likely to catch up to their peers through maturation (Law et al., 2008). Given the ramifications of persisting LI on language and literacy outcomes, therapy becomes of the utmost importance. Speech-language therapy matters. And it matters not only as an element of public good (i.e., helping children overcome immediate and long-term implications of LI) but clinically as well, as empirical evidence suggests that speech-language therapy results in significant behavioral changes (see Nye et al., 1987).

**Speech-Language Therapy for Children with LI**

From a human interest perspective, speech-language therapy provides an environment where children are understood and supported in their communication attempts. Speech-language therapy provides an avenue for collaborations where teachers not only receive support from the SLP on how best to instruct children with LI, but also receive education on the nature of LI. This may be one of the more significant aspects of speech-language therapy, as children with LI are generally viewed as less competent and less likeable by teachers than their typically-developing peers (Becker, Place, Tenzer, & Frueh, 1991; DeThorne & Watkins, 2001; Ebert & Prelock, 1994). Additionally, children with LI tend to have fewer friends (Fujiki, Brinton, & Todd, 1996; Guralnick, Connor,
Hammond, Kinnish, 1996) and feel more susceptible to bullying (Knox & Conti-Ramsden, 2003) as compared to their peers. These negative impressions secondary to LI may impact the socio-emotional wellbeing of children with LI as well as the amount of instructional support they receive from teachers (Birch & Ladd, 1997; Pianta, Steinberg, & Rollins, 1995). Through speech-language therapy, SLPs play a significant role in advocating for these children, educating teachers and peers, and scaffolding communication growth to alleviate the negative social ramifications of LI.

From a clinical perspective, a number of speech-language therapy studies suggest that speech-language therapy is effective in improving children's language outcomes (e.g., Leonard et al., 2006; Throneburg et al., 2000; Tyler et al., 2003; van Kleeck et al., 1998). Specifically, there are three strands of research that are of interest in considering speech-language therapy outcomes for children with LI: longitudinal studies, experimental studies, and descriptive studies. I discuss the contributions of each below.

Two longitudinal studies have informed our understanding of language growth for children with LI. First, the epidemiological study by Tomblin and colleagues out of Iowa investigated the impact of SLI on children's language and literacy development over time. Using this longitudinal data, Tomblin et al., (2003) investigated the pattern of growth for children with SLI from kindergarten through 4th grade. Their findings suggest much stability over time; after controlling for effects due to regression to the mean, study participants showed very little change in language impaired status. However, children with more specific deficits (e.g., expressive impairments only) were more likely to show
improvements from kindergarten to second grade than children with more global deficits (e.g., expressive and receptive, mild cognitive delays). It is important to note that only a small percentage of children from this epidemiological study were receiving speech-language therapy services (196 of 1,909 children; approximately 10%). As such, data from this study provides an index of how much growth might be expected due to maturation and exposure to general education curriculum; however, it does not inform our understanding of the role of speech-language therapy for this population.

A second longitudinal study out of Britain, the Conti-Ramsden Manchester Language Study, followed 272 children from 7 to 11 years of age (Conti-Ramsden et al., 1997; Conti-Ramsden & Botting, 1999) who were diagnosed with SLI and placed in a language-based classroom unit in the UK. This research group conducted a follow-up investigation of these students at 11-years-old to understand patterns of growth for children with LI (Conti-Ramsden et al., 2001). Of the 272 children identified as SLI at 7-years-old, 89% continued to present with language needs (falling 1 SD below the mean on at least one measure of language). Only 8% (n = 16) had resolved their difficulties. A study by Law et al. (2008) used this database to explore expected language growth over a four year period for a subsample of 196 children enrolled in the larger study. Their results found similar patterns of growth across all profiles of children with LI, indicating no significant differences in growth trajectories based on area of language needs. Findings from these longitudinal studies suggest much stability in growth over time for children with LI, but due to the sampled populations (children primarily NOT receiving speech-
language therapy services in the Iowa Epidemiological study and those in special classrooms in the Conti-Ramsden Manchester Language Study) these findings raise many questions as to the role of speech-language therapy in bolstering language growth for children with LI.

Several empirical studies offer evidence that speech-language therapy is effective in altering the developmental trajectories of children with LI. Nye and colleagues (1987) conducted a meta analysis of 43 speech-language therapy studies (comprising a total of 1,703 children with an average age of 6:11), investigating the overall effectiveness of treatment. For this analysis, they considered impacts across domains of language (semantics, syntax, pragmatics), population characteristics (age, IQ, diagnosis), and treatment characteristics (length, type, and outcome). Overall, speech-language therapy exhibited an average effect size of 1.04, with treatment groups gaining an average of 1 $SD$ more than control groups. More recently, researchers have shown similar patterns relative to language growth across language domains. van Kleeck, Gillam, McFadden (1998) investigated treatment impacts for phonological awareness training on 16 preschoolers with LI. Children in the treatment condition gained more over a 9 month period than the control group (effect size of .77). Tyler et al., (2003) compared four treatment schedules aimed at improving morphosyntactic and phonological abilities of 40 preschoolers with LI. Children the treatment conditions showed more improvement in both domains than children in the control condition ($d = .95$ to $1.53$ for morphosyntax; $d = .85$ to 1.22 for phonology). As a final example, Gillam and colleagues (2008)
conducted a large-scale, randomized control trial investigating language outcomes for 216 children with LI who were randomly assigned to one of four treatment conditions, including individual speech-language therapy, Fast Forward, computer assisted language intervention, and academic enrichment. Their findings showed that all forms of treatment were effective in improving children's abilities (average effect size of 1.08). Additionally, 53% to 75% of participants scored within normal limits on measures of language following treatment.

Research trials tout the effectiveness of speech-language therapy for children with LI, yet none of these studies sufficiently identify the active ingredients responsible for change. The current speech-language therapy literature utilizes different populations (preschool to school age) and treatment approaches targeting a range of language domains (morphosyntax, phonological awareness, language composite) and do so in tightly controlled, researcher-administered sessions, making it difficult to identify the elements of change from these studies alone. Additionally, the lack of external validity in these studies is a significant concern, as most of these therapy sessions were conducted by researchers in lab settings rather than clinicians in business as usual settings. Thus, it is uncertain whether or not these findings reflect what we might see in actual speech-language therapy settings.

Recently, a descriptive study prompted from the American Speech-Language Hearing Association attempted to capture business-as-usual practices by SLPs in the public schools. A task force was created to generate a National Outcomes Measurement
System (NOMS) designed to serve as evidence of the effectiveness of speech-language therapy (see Mullen & Schooling, 2010 for a summary of study findings). The NOMS study surveyed 597 SLPs serving over 14,800 students across 37 states. At the child's IEP meeting, SLP's completed a 7-point rating scale designed to capture changes in children's functional skills over time (FCM; 1 = least functional; 7 = most functional). SLPs scored participating children on each area of speech-language therapy (e.g., receptive language, expressive language, articulation). At the following IEP meeting, SLPs re-rated the children on the same areas of speech-language therapy and completed a questionnaire that provided the task force with information specific to service delivery methods. Results suggest that 55% of children with receptive LI and 57% of children with expressive LI showed one or more levels of functional gain over the year. Information from this descriptive study suggests that just over half of children receiving speech-language therapy made functional gains over the academic year; however, these results are based on SLP report alone and lack details to understand what aspects of speech-language therapy were influential in affecting such change.

Evidence from longitudinal, experimental, and descriptive studies over the past 25 years suggests that speech-language therapy is a conduit for meaningful change in children's language behaviors. However, the research is less clear in informing our understanding of the exact locus of change (i.e., the active ingredients), from a multi-dimensional perspective, within actual, school-based, speech-language therapy sessions. Given the wide-spread effects of therapy on language skills as reported in these studies,
one could argue that the active ingredients within speech-language therapy are multidimensional in nature, exerting direct and indirect influences on children's language growth. To date, however, we do not have strong empirical evidence as to what the active ingredients are within speech-language therapy in the public schools. Given the heterogeneity of children with LI (Conti-Ramsden & Botting, 1999) and the short and long term implications for persisting impairments (Johnson et al., 2010), it is important that we identify the active ingredients within speech-language therapy and understand how those ingredients relate to language growth for children with LI.

**Potential Active Ingredients of Speech-Language Therapy**

Identifying the active ingredients of speech-language therapy that contribute directly or indirectly to change in children’s language skills is the primary aim of this study. As a first step in identifying these active ingredients of speech-language, it is necessary to define features of speech-language therapy that may be influential to children's language growth as a function of theory and prior research. Features of speech-language therapy are conceptually defined for this current study as the conditions, content, and quality surrounding provision of treatment for children with LI. Such features may be conceived as active ingredients if they are found to be significantly associated with children’s gains during the context of treatment.

Researchers in related disciplines, such as counseling, and other areas within communication disorders, such as speech sound disorders and aphasia, have taken initial steps to identify significant features of speech-language therapy and posit that it is these
features, rather than provision of treatment alone, that comprise the active ingredients responsible for change in children's outcomes. Results from two meta-analyses specific to counseling treatment found that 30 to 40% of the variance in outcomes was attributable to discrete features of treatment, irrespective of the treatment approach alone (Lambert & Barley, 2002; Wampold, 2001). Similarly, Gillam et al., (2008) found no significant differences in children's outcomes across four treatment conditions. Children receiving individual speech-language therapy made equitable gains to those receiving tutoring. Reviews of studies in speech-sound disorders report equitable change for children with similar disorder patterns across multiple treatment approaches (for a summary, see Gierut, 2005). According to Gierut (2005), null findings from these treatment studies suggest that implementation of effective treatment approaches alone may not be sufficient for explaining children's outcomes.

As previously discussed, several studies have examined the effectiveness of speech-language therapy approaches for children with LI (Nye et al., 1987; van Kleeck et al., 1998; Tyler et al., 2003). However, the methodological limitations and restricted sample sizes prohibit SLPs from generalizing study findings to their clinical practice, and raise many questions regarding the locus of change for these children. Nonetheless, these studies, coupled with large-scale treatment studies in the educational and counseling psychology literature provide a framework to discuss potential features of speech-language therapy that may be influential in children's language growth and that may represent active ingredients. In this next section, I identify several features of speech-
language therapy that will be empirically examined in the present study as potential active ingredients of speech-language therapy for children with LI.

To organize these features, each feature is situated within one of three categories representing structural (i.e., circumstances in which language speech-language therapy is conducted), process (i.e., dynamic aspects of the speech-language therapy), and quality features (i.e., level of instructional and emotional support within the speech-language therapy process). These terms come from the educational literature which has identified various structural, process, and quality features of classrooms and instruction that are directly or indirectly relevant to children's outcomes with respect to language skill [see Mashburn et al., 2008; National Institute of Child Health and Human Development - Early Child Care Research Network (NICHD-ECRRN), 2002]. However, it is important to emphasize that these terms are used solely as an organizational tool, and it may be the case that these ingredients are conceptually organized by alternative groupings. As such, this next section describes features of speech-language therapy generally understood by both researchers and clinicians to be relevant to treatment. However, whether or not they relate to speech-language therapy and whether or not they function as active ingredients to children's language growth are empirical questions to be answered by the current study.

Structural Features. SLPs must make many decisions regarding a child's speech-language therapy plan, including fundamental issues related to where and how often therapy should take place. Specifically, SLPs must make decisions regarding service
delivery methods, namely the setting of speech-language therapy, grouping, and collaboration, as well as materials to be used.

**Service delivery methods.** Service delivery refers to the general way in which services are delivered, to include setting of the speech-language therapy, grouping, and collaboration. Setting of speech-language therapy typically represents one of three variations: (a) pull-out setting, in which a child or group of children is treated in a private setting (e.g., a speech room), (b) classroom setting, in which a child or group of children is treated within the general or special education environment, and (c) combination of settings, in which a child or children is treated in both pull-out settings and classroom settings. Grouping refers to the number of children treated at a given time as well as the language abilities of peers in that grouping. Individual, one-on-one treatment is when a child is treated by the SLP with no other children present. Small-group treatment is when a child is treated by the SLP along with several other children who may or may not also have disabilities. In terms of ability, children may experience treatment with other children who have IEPs or with typically developing children (i.e., those who do not have an IEP). Collaboration refers to the extent to which the SLP involves other persons in the treatment planning and delivery. Possible collaborations can involve other teachers, often referred to as consultative collaboration, as well as children’s caregivers.

ASHA (2000) recommends that no one service delivery model be implemented for all children, and IDEA (2004) mandates that this be so; every child is to be provided services in the "least restrictive environment" appropriate for the child's educational
needs to be met. What constitutes a least restrictive environment varies for each child - the place in which each child can learn to his or her potential with optimal time in inclusive-type settings (IDEA, 2004). To date, there is very little understanding of how and the extent to which various service-delivery components (setting, grouping, collaboration) may serve as active ingredients of speech-language therapy for children with LI, largely as few studies have explicitly manipulated one or more components of service delivery to examine variations in treatment effects. Several exceptions include studies by (McGinty et al., 2011 Throneburg et al., 2000; Ukrainetz, Ross, & Harm, 2009; Wilcox et al., 1991). In the next section, we discuss each aspect of service delivery models and example studies to support the potential relation of each to children's outcomes.

Setting. The professional community has mixed opinions on what constitutes an ideal setting for speech-language therapy, and given mandates from IDEA (2004) along with ASHA policies (1996; 2004) there may not be one gold standard therapy setting. Nonetheless, provision of speech-language therapy within a classroom setting may have several benefits. From the child's perspective, he/she remains in a more natural environment, missing fewer classroom activities to be pulled out for special assistance, has the opportunity to learn from peers with an SLP to coach those interactions, and may show greater generalization of language goals within an academic context (Beck & Dennis, 1997; Kavale, 2002; Westby, 2004). From the SLPs' perspective, they may be able to address more functional goals, reinforce skills within a natural context, and
provide language support for children with low language skills not identified as LI (Beck & Dennis, 1997).

However, providing therapy in a classroom may also have disadvantages, including extra time required to plan, eliciting teacher support, and difficulty focusing on specific language targets for individual children (Beck & Dennis, 1997; Ehren, 2000). As a result, some would argue that pull-out therapy settings may provide more opportunities for explicit attention to targeted language needs thereby resulting in faster remediation of skills (Ehren, 2000; Elksnin & Capilouto, 1994). Additionally, consideration of setting may vary with children's characteristics, including area of language need and age. In a survey of SLPs by Elksnin and Capilouto, (1994) SLPs were more likely to provide classroom-based therapy for younger children, as well as those with language needs as opposed to SSD, fluency, or voice concerns.

Descriptive studies of current SLP practices indicate that over 75% of children with LI in the public schools receive pull-out therapy, regardless of age or language need (Mullen & Schooling, 2010; Brandel & Loeb, 2012). However, empirically-based treatment studies utilize a range of service delivery options as a context in which the speech-language therapy in question is implemented, including individual and classroom-based settings (Ellis et al., 1995; Farber & Klein, 1999; Valdez & Montgomery, 1997), with several studies revealing strong associations between classroom-based therapy with improved outcomes (Throneburg et al., 2000; Valdez & Montgomery, 1997; Wilcox et al., 1991; see also McGinty & Justice, 2006).
As an example, Wilcox et al. (1991) investigated classroom-based versus individual speech-language therapy for 20 preschoolers with LI (10 in each condition). For this treatment, investigators selected 10 target words unique to each child and modeled each word 10-15 times per session. Speech-language therapy occurred twice weekly for 12 weeks, for a total of 24 sessions. Researchers controlled for effects of dosage, ensuring no child received more than 15 models in one session) as well as for style of interaction (both classroom and individual speech-language therapy used naturalistic, child-led activities). Their results found that children in both settings gained in vocabulary following the treatment. However, children in the classroom-based condition showed greater generalization of learned skills than peers who received individual instruction (a large effect size of .81). Their findings suggest that the classroom setting may facilitate carryover beyond the fundamental learning of new skills. While researchers took care to control the number of models, being in a classroom situation could have led to children "overhearing" target words in common with other peers. Additionally, the children in the classroom condition met for 3 hours whereas the children in the individual speech-language therapy setting met for 45 minutes. Although the number of models were equitable, greater exposure to language in general could partially explain generalization as well as advantages to a classroom setting.

Grouping. A body of research suggests that exposure to models from typically-developing peers may be advantageous for children with LI (Goldstein, English, Shafer, & Kaczmarek, 1997; Harper, Mallette, & Moore, 1991; Kohler & Greenwood, 1990;
McGregor, 2000). In fact, research by Justice, Petscher, Schatschneider, & Mashburn, (2011) found that the average language level of children's peers had much influence in the amount of language growth experienced over a year. Children with low language skills nested in classrooms in which the average language score was 1 SD below the mean showed a decrease in language ability over the year (-1.5 SD). In contrast, children with low language nested in classrooms with average language abilities overall showed stable language abilities over the year.

In addition to who children with LI are grouped with during speech-language therapy (those with or without disabilities), there is some question as to how many peers is optimal. For children receiving therapy in a classroom setting, peer groupings may be conflated with the setting, as classroom-based settings generally include a larger group of peers. This may not be so evident in pull-out settings. Much of the speech-language therapy research is done in one-on-one sessions, where no other children are present (Fey, Cleave, Long, Hughes, 1997; Hassink & Leonard, 2010; Leonard et al., 2008); however, surveys of SLPs in the public school suggest that most children are seen in small group settings (Brandel & Loeb, 2012; Mullen & Schooling, 2010). Beyond optimal situations for children, SLP's caseload size and scheduling restrictions may influence both the quantity of peers in a given therapy session as well as who is in those sessions (same age peers vs range of age or abilities; ASHA, 2010; Katz, Maag, Fallon, Blenkarn, & Smith, 2010).
A study by McGregor (2000) investigated the peer effects on children's narrative abilities. In the third of a three-part study, two preschoolers identified as lowest performers by their classroom teacher were paired with high performing peers. In these dyads, the high performing peer chose a picture book, told a self-generated narrative to the low performing peer (with minimal clinician scaffolding) and then asked the low performing peer to retell the story. Five control groups of ability and age-matched peers performed similar tasks. McGregor documented more rapid growth in both number of story grammar elements and number of lexical units for the children paired with higher-performing peers than the control group. Additionally, these peers manifested generalization of narrative skills to novel story telling experiences. While small in scope, McGregor's study suggests children's exposure to peers with more advanced skills may be influential to their growth.

Collaboration. A final consideration of service delivery models is the extent to which SLPs collaborate with others in the provision of services to children with LI. Collaboration by definition is the sharing of knowledge or expertise to promote more consistent understanding and awareness of children's needs to influence gain. Collaboration may take many forms to include conversations of children's needs and carryover of skills, to co-teaching of identified language needs (ASHA, 1996; Hadley, Simmerman, Long, & Luna, 2000). Although the opportunity for collaboration is one of the benefits of classroom-based therapy settings, the two are not necessarily synonymous, as some SLPs provide classroom-based therapy independent of support from the
classroom teacher (Beck & Dennis, 1997; Elksnin & Capilouto, 1994). Teachers and SLPs can collaborate in either a pull-out or classroom-based setting through either direct or indirect ways, such as identifying areas of need, establishing goals, planning instructional and carryover activities, conducting therapy/instruction, and progress monitoring (Farber & Klein, 1999; Miller, 1989; Russell & Kaderavek, 1993).

A study by Throneburg et al. (2000) investigated the effect of three service delivery models (collaborative, classroom-based, pull-out) with respect to improving children's vocabulary skills. The researchers randomly assigned 12 classrooms to participate in one of the three conditions, with 177 children participating within those classrooms, including those with and without speech and LI. All three conditions were controlled for targets (i.e., the words that were taught), materials used, and frequency of speech-language therapy. Their results showed a main effect for the collaborative model: children with LI gained more in vocabulary after 12 weeks of speech-language therapy than children receiving therapy in a classroom-based setting without collaboration (effect size of 1.56) and children receiving therapy in a pull-out setting (effect size of .31). In this study, children were nested within classrooms, and this was not accounted for statistically. As a result, the magnitude of the significance between settings may be inflated. Nonetheless, their study provides evidence of the importance of collaborative frameworks relative to children's language growth.

Evidence on ideal service delivery models is inconclusive. While the existing studies in the speech-language pathology literature suggest that collaborative, classroom-
based models with exposure to typical peers may promote greater language gains for children with LI, additional studies are needed to fully understand how service delivery methods are being implemented and how those relate to children's gains. Additionally, many of these studies focus on preshoolers at risk for language delays; further investigation is needed to understand if service delivery models are an active ingredient of speech-language therapy for children in early elementary grades. Given that this study is situated within public schools and SLPs are asked to align speech-language therapy with academically-based content, for this study will consider pull out (i.e., speech room) versus classroom-based therapy sessions, group size, groupings with typically-developing peers, and collaboration with general education teachers as potentially active ingredients of speech-language therapy for children with LI.

**Materials.** The materials feature of speech-language therapy refers to the material supplies the SLP uses within a speech-language therapy session, to include games, writing materials, books, crafts, toys, manipulatives, picture cards, worksheets, or computer games, to name a few. Theoretically, for children with LI who have difficulties communicating with others, materials used in speech-language therapy may provide a means to not only make language more iconic, but may also increase children’s motivation and engagement. The utility of high-interest materials has long been a technique utilized by SLPs working with late talkers as a means of enticing children’s communicative attempts for toys placed just out of reach (e.g., Brady, Steeples, & Fleming, 2005; Yoder, & Warren, 1998). SLPs using this approach manipulate the child's
environment with materials known to be of interest to the child, including toys, electronics, and food items, so as to create a need for communication. For example, the SLP might place desired food items in a clear container with a lid too tight for the child to open on his/her own. In such scenarios, the SLP uses high-interest (and desirable) materials to evoke from the child more advanced forms of communication than the child typically relies upon.

Within the research community, several studies mention use of materials to facilitate treatment (e.g., Tools of the Mind, It Takes Two to Talk) or to assess generalization to other contexts (e.g., Yoder et al., 1995). However, for these studies, the materials were used as a means to conduct treatment and were not manipulated in and of themselves (e.g., Bodrova & Leong, 2007; Girolametto, Weitzman, & Greenberg, 2004). Additionally, several professional articles discuss the use of materials in addressing specific targets for certain population, such as using stick drawings and graphic organizers for children with LLD (Ukrainetz, 1998), pull toys and cars with preschoolers to demonstrate appropriate voice patterns (Andrews & Summers, 1993), computerized programs used in articulation drills (Shriberg, Kwiatkowski, & Snyder, 1990) and delayed auditory feedback devices for use with children and adults who stutter (Kalinowski, Stuart, Wamsley, Rastatter, 1999). Nonetheless, a few speech-language therapy studies suggest the importance of materials used in therapy, including visual supports, picture books, and graphic organizers, to language outcomes.
Specific to visual supports, Carr and Felce (2007) investigated the use of a picture exchange system (PECS; Bondy & Frost, 1994) in preschool classrooms for children with Autism Spectrum Disorder (ASD) as compared to control classrooms (that did not use a picture-exchange system). Of the 24 children in the treatment condition, five children showed increases in speech production and no children who decreased speech production during treatment. By contrast, only 1 of the 17 children in the control condition gained over the treatment period, but four of those children showed decreases in speech production. While researchers argue that this study points to the effectiveness of PECS in a classroom situation for improving communication for children with ASD, these findings cannot be generalized beyond the study for the following reasons. Primarily, no parametric statistics were utilized in analyzing the data; all results were considered qualitatively. Second, the speech-language therapy was provided by researchers, so although the treatment was conducted within the children's classrooms, it is unclear if use of visual supports would be feasible or effective in natural settings. Furthermore, without the use of statistics, other aspects of the environment were not controlled for; it is difficult to know if use of a particular material (PECS) was responsible for the change in children's skills or if other aspects of the environment contributed to their growth.

Ukrainetz (1998) outlines the use of one specific form of graphic organizer, that of stick writing, to facilitate language. With stick writing, children are taught to represent thoughts in writing through simple pictures on paper (i.e., stick figures, sketches). These depictions may represent information the child has heard (e.g., from a story read by the
teacher or SLP) or planning for the child's own narrative. Children can then use the stick writing to generate the narrative. Ukrainetz reported case studies results for six children's narrative productions, comparing stick writing with more typical written planning (i.e., representing ideas with words only). Five out of six children showed increases in the quantity of words used with stick writing as opposed to written planning. Additionally, four out of the six children also generated higher quality narratives following stick writing planning than when written planning was utilized. Results of this study suggest graphic organizers in the form of stick writing may be a useful material in targeting narrative production for children with LI; additional research is needed to understand the extent to which such materials might be influential in speech-language therapy within the public schools.

Furthermore, several studies have documented effective speech-language therapy practices using books as a therapeutic material (Crain-Thoreson & Dale, 1992; Debaryshe, 1993; Swinson & Ellis, 1988; Snow, 1983). Dale, Crain-Thoreson, Notari-Syverson, and Cole (1996) compared two mother-child interactions: one using books as a context and one using conversation during play. Both groups were trained in their particular approach and researchers controlled for effects of length of speech-language therapy and overall techniques used. Thirty-three 2- to 4-year-old children and their mothers were randomly assigned to one of these conditions. Their results indicated an advantage in improved mean length of unit and number of different words used (i.e., measures of morphosyntax and semantics) for the children who participated in book
reading interactions. Both groups were trained to utilize similar language techniques (e.g., use of questions, expansions, imitations), therefore, improved outcomes for the book-reading group suggests that the use of books in speech-language therapy may add an important element to therapy sessions, effective in supporting children's language growth.

Speech-language therapy research suggests that the use of certain materials within speech-language therapy may impact changes in language over time; however, extensive methodological concerns of these studies prevent findings from generalizing to other situations or populations. Empirically, we have very little understanding if materials used in speech-language therapy relate to language growth either as a main effect or indirectly. For instance, does use of books in speech-language therapy alone relate to gains in communication, or does an interaction between use of books and intensity of speech-language therapy result in stronger outcomes? In the current study, I consider the SLPs' use of specific materials, as well as a total number of different materials used during sessions, as components of speech-language therapy for children with LI.

**Process Features.** Process features represent the more dynamic aspects of the therapy environment which may change from moment-to-moment, such as who is directing the focus of the therapy session (SLP or child) and the techniques the SLP is using. Similarly to structural features, the SLP must make decisions about some process features when creating a child's therapy plan (e.g., frequency of speech-language therapy) but many more decisions must be made in moment-by-moment interactions during the
speech-language therapy session (e.g., which technique to use, which area of language to prompt for next). These process features include: direction (who is leading and interacting in the speech-language therapy sessions), targets (language domain being addressed in the speech-language therapy session), techniques (the strategies utilized within an speech-language therapy session), and frequency (how much speech-language therapy is required to affect change).

**Direction.** Direction refers to who is managing or leading the speech-language therapy interactions at a given point in time, to represent a continuum ranging from child-led (the child is leading or guiding the interactions) to clinician-directed (the adult is leading the interaction with hybrid approaches, or joint-led, falling somewhere in between (the child and adult share the leading of the interaction). The direction style adopted by SLPs may reflect their theoretical approach to interactions and the role of children within interactions – namely, that they should be responded to versus responsive. There is a long tradition in the developmental literature on the importance of responsiveness to children for promoting early language growth (see Landry, Smith, & Swank, 2006; Landry et al., 2012; Taylor, Anthony, Aghara, Smith, & Landry, 2008) and there have been related efforts in the LI literature on training SLPs, teachers, and parents to engage in more responsive interactions with children, in which children have and maintain the lead (Fey, Cleave, Long, & Hughes, 1993; Girolametto, Weitzman, and Greenberg 2003; Girolametto, Weitzman, Wiigs, & Pearce, 1999). In fact, research indicates differential patterns of growth based on these interactions.
For example, Connor and colleagues (2006) found that the volume of child-directed interactions with teachers was a positive predictor of children’s vocabulary skills; interestingly, the converse was true with respect to children’s literacy skills, in which adult-directed interactions were better predictors. This finding suggests that interaction styles may not have uniform influence on children’s outcomes, but that child-directed interactions may be more closely related to children’s language growth in contrast to more adult-directed styles.

Additionally, Girolametto and colleagues (2000) investigated the interactions of 20 teachers and 80 toddlers and preschoolers in their classrooms and found that teacher-directed interactions varied as a factor of activities; less structured activities, such as playtime, resulted in significantly fewer teacher-directed interactions than more structured activities, such as story time. Importantly, study findings revealed negative correlations between teacher directiveness and the quality and quantity of children’s talk in the classroom. Girolametto, Weitzman, Wiigs, and Pearce (1999) found similar findings in a study of mother-child interactions. Mothers of 12 toddlers with expressive language delays were taught to let their child lead interactions and to use specific language techniques in response to their child's initiations. Their findings showed significant correlations between mothers who followed their child's lead using facilitating strategies and children's expressive vocabulary growth 4 months later.

This large volume of work related to direction raises several questions for further study. Although Connor et al. (2006) found differential effects for various models of
instruction, it is unclear if this pattern of influence applies to other contexts, such as interactions settings. Additionally, while child-led interactions were associated with more child talk in the Girolametto studies (2000; 2003), the correlational design prevents causal conclusions from being drawn. Finally, the Girolametto studies as well as the Connor study involve young children with mild delays. Further research is needed to understand the role of direction in speech-language therapy and how direction relates to language outcomes for early elementary children with LI. Given the mixed findings relative to direction of treatment and the understanding that SLPs may be addressing language-based targets within an academic framework, in this study I conceptualize "Direction" as a hybrid of approaches on the continuum of direction, specifically time spent in joint interactions, with the SLP primarily leading the interaction.

**Targets.** Targets refers to the area or domain of language being addressed during speech-language therapy. One might anticipate that the extent to which a specific skill, such as vocabulary, is targeted in speech-language therapy would be a key mechanism in terms of promoting change in that target. More specifically, given the heterogeneity of symptoms of LI in children (Conti-Ramsden & Botting, 1999; Conti-Ramsden et al., 1997) and the mandate by IDEA (2004) that education be individualized to meet the unique needs of children, we would argue that targets addressed in speech-language therapy as measured by time spent working on that target should be important for predicting children's language gains. Theoretically, children receiving speech-language therapy in which the targets map directly to their areas of language weakness should
make more gain over time than children whose targets during speech-language therapy do not reflect their specific needs.

Research across the discipline suggests this may very well be the case. Overall, treatment focused specifically on an area of weakness (language symptom) has positive impacts in children's gain in those same areas (e.g., Leonard et al., 2008; Proctor-Williams & Fey, 2001; van Kleeck, Woude, Hammett, 2006). A study by Leonard and colleagues (2008) investigated morpheme target selection for children with SLI. In their study, 25 preschoolers with SLI who demonstrated delays in use of morphological structures were assigned to one of two treatment conditions: one targeting third-person singular or another targeting auxiliary forms (is, are, was). All participants received 96 treatment sessions and were tested across three time points on their use of both treatment conditions as well as a control condition of past tense -ed. All other aspects of the treatment, including treatment schedule, activities, and strategies, were controlled for. Results indicated that children in each group showed significant gains over time for the morpheme targeted during speech-language therapy; these gains were significant over the control morphemes not targeted in speech-language therapy. While their study suggests the importance of treatment targets on children's outcomes, limitations to the study prevent generalization to a wide population. First, the target domain for this study was very narrow to one aspect of a child's syntax. It is therefore unclear how target selection would influence gain for children with delays in other language domains. Second, this
treatment was conducted in a university clinic under tightly controlled settings. It is unclear if findings would extend to treatment conducted in more typical settings.

As another example of children gaining in areas specifically targeted, Tyler and Sandoval (1994) focused on treatment targets with respect to phonology and syntax. These researchers randomly assigned six preschoolers with moderate to severe phonological and syntactic disorder to one of three treatment conditions: phonology only, language only, or both. All participants received 45-minute speech-language therapy sessions, two to three times a week for 12 weeks. Children in the phonology-only group received speech-language therapy that only targeted phonology; children in the language only received speech-language therapy targeting language; children in the third condition received speech-language therapy that addressed both phonology and language targets. Results showed overall that participants made gains in the area of language treated. Children in the language-only group made gains in language, but showed virtually no growth in phonology. Children in the phonology-only group made significant gains in phonology with minimal change in language, yet children in the combo treatment group made significant gains in both phonology and language. This study offers additional evidence for the value of aligning treatment targets to areas of need in children's language systems - overall, children made gains in the area(s) targeted. However, these results must be tempered in that not all features of the speech-language therapy were reported. It is unclear whether children across groups and within groups received equal dosage of
treatment opportunities, what kind of feedback the researchers provided, and how the exact stimulus items were chosen.

In contrast, research within speech sound disorders does show potential cross-over effects of therapy targets to error patters not specifically targeted (e.g., targeting a more complex skill to influence earlier-developing, error patters; Gierut, 2001, 2005). A corpus of work in this literature has proposed that targets addressed during speech-language therapy are the active ingredients involved in change over time, and that children receiving treatment focused on complex targets demonstrate greater gains across all error patterns, both treated and untreated (Gierut, Morissette, Hughes, & Rowland, 1996; Gierut 1998, 2001, 2005; Tyler & Figurski, 1994; Powell, Elbert, & Dinnsen, 1991; see also Kamhi, 2006).

For example, Gierut (1996) investigated treatment impacts for 9 preschoolers with phonological disorders across two within-subject experiments. In the first experiment, early and later-developing phonemes were selected as treatment targets and were introduced during all sessions (1 hour sessions, three times per week). Greater gains were noted for the later-developing phoneme during speech-language therapy and those gains continued over time (2 months post treatment) for all three participants. In the second experiment, three children were randomly assigned to receive treatment targeting early developing sounds or later developing sounds. All other aspects of speech-language therapy were controlled. Researchers considered change of targeted phonemes, within
class change (untargeted sounds with similar phonemic properties) and across-class change (untargeted sounds with differential phonemic properties).

Children in both experimental groups experienced change in targeted sounds and within class change, but two important distinctions were noted. For children whose speech-language therapy targeted later-developing sounds, they demonstrated quicker generalization to within class, nontargeted sounds than peers in the early-acquiring condition. Furthermore, children in the later-developing condition experienced change across classes of sounds; a result that was not shared with children in the early-acquiring condition. This study utilized strong methodological design to account for other effects of treatment, such as presentation of targets, severity of impairments, concomitant diagnoses, even within a small subject design. However, other aspects of the treatment, such as dosage (number of opportunities provided) were not discussed, and may have exerted influence on study results. Nonetheless, results from this study suggest that targeting complex, later-developing forms may be significant in affecting change over time.

While much has been done in the communication sciences relative to the nature of LI across language targets, including syntax (Leonard et al., 2002; Loeb & Leonard, 1991; Rice, Wexler, & Hershberger, 1998), semantics (Deevy & Leonard, 2004; Gray, 2006; Nash & Donaldson, 2005; Kiernan & Gray, 1998; McGregor, Sheng, & Ball, 2007; Sheng & McGregor, 2010), and narratives (Byrd, Logan & Gillam, 2012; Fey et al., 2004; Gillam & Carlile, 1997; Ukrainetz & Gillam, 2009), strikingly fewer studies have
investigated treatment of these domains (but see also Leonard et al., 2008; Fey, Finestack, Gajewski, Popescu, & Lewine, 2010; Gillam, Gillam, & Reece, 2012; Gillam et al., 2008; Proctor-Williams, Fey, & Loeb, 2001; van Kleeck et al., 2006). Given the theoretical significance of targets aligning with children's language needs and the relation between target selection and children's growth established in medical and speech sound disorder literature, empirical research is needed to understand how language targets relate to speech-language therapy practices in the public schools. As such, in this study, I will conceptualize "Targets" as the time spent in language-related targets during speech-language therapy for children with LI.

**Techniques.** Techniques refer to the specific behaviors or strategies the SLP uses to bring about change in the child's language system. Theoretically, these techniques serve two important functions: (a) to support a child's completion of skills or tasks they otherwise would be unable to accomplish, and (b) to provide a child with effective strategies they can internalize and eventually use independently (Schneider & Watkins, 1996). In this regard, techniques are not only tools for the SLP to use in speech-language therapy to promote the child's accuracy in completing language tasks, but more importantly, are the tools that will become a part of the child's internal language system (Schneider & Watkins, 1996).

In clinical contexts, speech-language therapy techniques are often conceptualized as an SLP's "tool box" in which the professional has many techniques available to use in a moment-by-moment basis in response to the child's needs. Authors of speech-language
therapy textbooks, as utilized in speech-language pathology graduate programs, often
devote several pages to the definition and explanation of various treatment techniques. As
an example, Paul (1995) introduces several aspects of language modeling techniques
(SLP's use of appropriate language) to include self-talk and parallel talk (SLP describing
her own and child's actions), imitations (child repeats what SLP says), expansions and
extensions (elaborating child's response in semantic and syntactic form), and recasts
(elaborated expansions). Norris and Hoffman (1990) provide an additional list of possible
strategies SLPs might utilize in supporting language use for children within
communication contexts, including cloze procedures (You want a ____), leading
questions (Who flies into space?), gestures (spreading arms wide apart to cue "big"),
offering choices (is that an astronaut or a firefighter), feedback (that's right; an astronaut
flies into space), and phonemic cues (He is called an as______) to name a few.

There are great many of these discussed in the literature, which we can generally
refer to as “language-facilitating techniques." Language-facilitating techniques are
designed to bring about change in kids skills, and there is evidence in the literature to
support these when used by parents, teachers, and SLPs. Girolametto and colleagues from
the Hanen Center have studied parents' teachers' use of language-facilitating techniques
in home and preschool classroom settings as a means to support children's language
development (Girolametto, 1988; Girolametto, Pearce, & Weitzman, 1996; Girolametto
et al., 2000; Girolametto et al., 2003; Girolametto, Weitzman, Wiigs, & Pearce, 1999).
These techniques might be further categorized by those intended to evoke children's
responses (i.e., evocative strategies such as leading questions, choices) and those that do not (i.e., non-evocative strategies such as modeling, recasts). In this review, we consider empirical evidence relating use of techniques to children's language growth as well as a few studies that compares techniques relative to language outcomes.

Of these techniques, recasts are a specific speech-language therapy technique that has received considerable attention in the literature (Camarata & Nelson, 2006; Fey et al., 1997; Fey & Loeb, 2002; Proctor-Williams & Fey, 2007; Proctor-Williams et al., 2001). By recasting, a SLP models more sophisticated language by adding salient information to the child's utterance to either extend information (e.g., child: "Me go" SLP: "You go to the store with mom?") or to correct productions (e.g., child: "Me go" SLP: "You went.") or as a combination (e.g., child: "Me go" SLP: "You went to the store with mom").

A study by Hassink and Leonard (2010) studied the effect of recasting on the use of third person singular for 17 preschoolers with SLI. At the beginning of the study, participants only used third person singular 3.9% of the time in obligatory contexts. Each preschooler received 96 individual speech-language therapy sessions in which the clinician used non-corrective recasts (i.e., did not require child to correct the production) specific to third person singular as opportunities arose during two speech-language therapy activities (story reading and playing with story props). Regression analyses indicated that use recasts accounted for 44% of the variance in use of third person singular at the midpoint of speech-language therapy (after 48 sessions) and 30% of the variance after all 96 sessions.
Similarly, Yoder and colleagues (1995) investigated the utility of expansion (another aspect of language modeling in which the SLP adds information to the child's utterances) in treatment aimed at improving the mean length of utterance (MLU) of children with language delays. Four children (24-54 months) participated in this study, conducted four times per week for 16 weeks. Different books were assigned to each child to ensure a developmental match to the child's current lexicon. Once that book was selected, researchers used that book for the duration of the treatment. The researcher followed a treatment pattern of asking the child a question about the pictures in the book, pausing, then expanding the child's response. Their study identified an effect of treatment for two of the participants, as indicated by strong increases in MLU immediately upon introduction of treatment. Due to this study's design, the researchers could not empirically determine the cause the other two participants showed inconclusive effects; however, these two participants began the study at a higher developmental level which led researchers to question whether this technique has differential effects on certain populations.

While there is a large empirical base relating use of language-facilitating techniques to language growth, far fewer studies have investigated differential impacts of these techniques. One such study by Bradshaw et al. (1998) contrasted use of two primary techniques, cloze procedures/expansions and questions/modeling, on children's ability to answer questions, make inferences, and use more complex syntax during a book reading therapy session. Two preschoolers participated in a 30 minute session, two times
a week for six weeks. In this researcher-conducted experiment, both children received both conditions during each session (15 minutes using the cloze procedure/expansion condition and 15 minutes in the question/modeling condition). In the cloze procedure/expansion condition, the researcher asked questions to elicit basic knowledge related to the book, expanded the child's utterance, and then used cloze procedures to elicit more complete information and inferences. In the question/modeling condition, the researcher asked similar questions and in response to the child, either asked a follow-up question or modeled the appropriate answer. Their findings indicated that both children demonstrated higher number of inferential statements and increased syntactic forms during the cloze procedure/expansion condition than the question/modeling condition.

As a second example, Yoder and Stone (2006) conducted a randomized trial of 36 children with ASD, investigating the differential impacts of two speech-language therapy techniques on children's outcomes for 36 children with autism-spectrum disorder. Children were randomly assigned to one of two speech-language therapy conditions: one using PECS and another using high quality language modeling. Their results indicated that children in the PECS condition gained more in number and frequency of word production (effect sizes of .63 and .5 respectfully) than peers in the control condition, suggesting that visual strategies may be associated with increases in verbal output. However, these effects were not seen 6 months post treatment - children in the PECS demonstrated similar patterns of communication as their peers in the control condition, which raises questions both to the impact of visual supports as well as interactive effects.
within treatment. In this study, children received three, 20-minute treatment sessions weekly for 6 months in a research facility. It may be that the impacts seen in the PECS condition interacted with the high intensity of treatment to affect short term gains.

Besides the lack of generalization due to the restricted sample size \((n = 2)\), there were many confounding factors associated with this design that makes interpretation challenging. For one, researchers used different books with each condition. The nature of the book and background knowledge of the children could have influenced participation and sophistication of responses in these conditions. Additionally, the researchers note that some lack of responsiveness from the children could have been due to limited understanding of the tasks or kind of information the researcher was looking for. However, their study does suggest that different strategies may influence the kind of responses from children, although the long term impact of those techniques is unknown.

Much of the existing research informing our understanding of techniques used to facilitate language growth focuses on younger children (toddlers to preschoolers) and results are mixed as to whether or not these strategies are the impetus of change. Research focused on speech-language therapy suggests the influence of strategy use on children's outcomes (e.g., Hassink & Leonard, 2010; Yoder et al., 1995); however, these studies have significantly small sample sizes and are restricted to one domain of language. Additionally, there is a stark omission of speech-language therapy designs that specifically contrast the influence of various techniques (but see Bradshaw et al., 1998). Despite the diversity and wide-spread application of such techniques in clinical realms,
no studies of which we are aware have specifically investigated SLP's use of techniques as an active ingredient in speech-language therapy in the public schools, nor the relation between those techniques and children's language outcomes. Given the mixed findings relative to effective therapy techniques, in this study, I investigate the relation between evocative techniques (i.e., those that evoke a response from a child) and non-evocative techniques (i.e., those that do not require or evoke a response from a child; Lovelace & Stewart, 2007) on children's language gain.

**Frequency.** Frequency, the number and length of therapy sessions (Warren, Fey, & Yoder, 2007), is receiving increased attention in the educational and speech-language pathology literature of late (Baker, 2012; Brandel & Loeb; Mcginty et al., 2011; Mullen & Schooling, 2010; NRP, 2000; Ukrainetz et al., 2009). Researchers and clinicians alike have a vested interest in understanding how much speech-language therapy is sufficient to achieve optimal results. Arguably, the amount of speech-language therapy a child receives has much to do with outcomes. As the medical sciences have proven, even the most effective therapy must be delivered at an appropriate intensity to achieve optimal results (e.g., Boonen, Bouillon, Haentjens, & Vanderschueren, 2006; Cannon, 2000; Sam, Ernest, Walsh, & Williams, 2012).

However, the exact relation between intensity of services and speech-language therapy outcomes is still unclear. For one, the frequency and dosage of speech-language therapy within research studies is quite variable, making it difficult for researchers and clinicians to compare outcomes between studies. Additionally, results of these studies are
mixed; some research findings suggest that increasing the amount of speech-language therapy may lead to more gains (see Law et al., 2004), but other results indicate that more may not always relate to better outcomes (NRP, 2000; McGinty et al., 2011). In this section, we review meta analyses on the heterogeneity in intensity within speech-language therapy studies, mixed findings on the role of intensity on children's outcomes, and current indicators of intensity within school-based speech-language therapy.

Three meta analyses in the field of communication disorders highlight the variability in provision of intensity within speech-language therapy research (Baker & McLeod, 2011; Nye et al., 1987; Law et al., 2004). Baker and McLeod (2011) investigated intensity schedules of 134 studies specific to speech sound disorders. Studies reported sessions lengths ranging from 15 minutes to 270 minutes, frequency of once a month to three times a week, and a total duration range of 3 to 46 months (average of 12 months). An additional 16% of speech-language therapy studies didn't report intensity details. Nye et al. (1987) considered variability in intensity with associated effect sizes of speech-language therapy studies for children with LI. Of the 43 studies included, the total duration of therapy ranged from 1 to 208 weeks (average of 38 weeks) and utilized a session duration of 60 minutes. Of these studies, those that lasted longer than an average session (i.e., > 60 minutes) resulted in smaller effect sizes, and therapy sessions lasting between 4 and 12 weeks resulted in the highest effect sizes; both of which suggest a point at which more treatment no longer results in better outcomes. Similarly, a meta analysis by Law et al. (2004), based on 13 therapy studies of children with LI, showed greatest
effects for syntax and phonology therapy that lasted more than 8 weeks, indicating that a minimum amount of speech-language therapy may be necessary to see changes in behavior.

Studies by Proctor-Williams and Fey (2007) and Bellon-Harn (2012) found no significant differences in children's outcomes as a result of increased frequency of speech-language therapy (4x/week for 6 weeks versus 2x/week for 12 weeks; Bellon-Harn, 2012). As a specific example, a study by Ukrainetz et al. (2009) investigated the effects of treatment intensity on phonemic awareness outcomes. Participants were 41 5- and 6-year-old kindergarten students who manifested weak letter-sound knowledge. For this treatment, children were divided into three groups, including a concentrated practice group (who received treatment three times a week), a dispersed treatment group (who received treatment one time a week) and a control group who received vocabulary instruction. Treatment sessions were controlled for duration (i.e., 30 minute sessions), dosage (20 teaching episodes per child), and total number of sessions (i.e., 24). Their results showed that children in both treatment groups outperformed their peers in the control group on measures of phonemic awareness at the middle of the year and the end of the year. However, there were no significant differences between the two treatment groups; children with more frequent treatment did not gain more long term than children who received more dispersed treatment. Interestingly, their study found that children with more moderate delays showed more benefit from this supplemental treatment than children with mild delays. Their results suggest not only that mass practice may not have
increased effects over dispersed practice, but that children may benefit differentially from treatment services outside of the classroom.

However, other treatment research has demonstrated significant effects on outcomes relative to treatment intensity. A study by Fey et al. (1997) found significant treatment impacts on children enrolled in high-intensity, direct speech-language therapy sessions. A total of 28 preschoolers with LI were randomly assigned to one of three conditions: clinician group for 10 months, parent group for 10 months, or 5 month speech-language therapy (five kids in the clinician condition, five in the parent condition) and were provided speech-language therapy in two, 5-month blocks (with the exception of the 5-month treatment condition). Children in the clinician group received individual speech-language therapy once a week and group speech-language therapy twice a week for 5 months. For the parent condition, parents of children with LI received training on language facilitating strategies weekly for 12 weeks and then once a month for the remainder of the treatment. Results indicated greater gains for children in the clinician condition. Additionally, there was less change across the second phase of treatment than the first. However, the intensity of services also changed during the second phase (one 2-hour group session and one 30-minute session per month) so it is unclear if the decrease in gains were due to a plateau effect or the change in intensity.

Studies from the aphasia literature also suggest that increases in intensity relate to better outcomes (Cherney, Patterson, Raymer, Frymark, & Schooling, 2008; Basso & Caporali, 2001; Denes, Perazzolo, Piani, & Piccione, 1996; Hinckley & Craig, 1998). A
study by Hinckley and Craig (1998) conducted a progression of three studies with 15 patients each. For each study, patients received two, 6-week blocks of intense treatment separated by 6 weeks of non-intense treatment. For all three studies, the intense treatment remained the same (i.e., ~20 hours per week for a total of ~120 hours); the non-intense schedule varied (i.e., study 1: no treatment; study 2: 1-2 hours per week; study 3: 3-5 hours per week). Their results showed greater effect sizes for the intense blocks (effect sizes ranging from .7 to 1.73) than non-intense (effect sizes ranging from .06 to .44; no effect was indicated for study 1). Their findings suggest the value of intense treatment schedules, although it is unclear from this study's design if the total number of hours per 6 week schedule (i.e., 120 hours) would result in similar results over a longer duration. A meta analysis by Cherney et al. (2008) considered 10 studies that met criteria for inclusion in the review. Findings suggest overall improvement in outcomes for patients receiving "more intensive" treatment as opposed to "less intensive." However, Cherney and colleagues note that this is a generalization; the extent of benefit from higher levels of intensity varied across patient characteristics, such as severity and post-morbidity.

Finally, McGinty and colleagues (2011) suggest that frequency may interact with other features of treatment relative to children's outcomes. Their study investigated the effects of dosage and frequency of a print-referencing treatment on children's outcomes. Participants in this study included 367 children from 55 early childhood classrooms. Teachers attended professional development in which they were instructed in how to implement the print referencing treatment during story book reading. Subsequently, all
teachers were randomly divided into two groups: a high-dose frequency group (conducted the treatment four times per week) and a low-dose frequency group (conducted the treatment two times per week). Both groups were given two weekly targets and asked to address both targets a minimum of two times within each treatment session; however, most teachers addressed those targets a far greater number of times than the required amount. Results showed that this increase in dosage (teachers who addressed print referencing targets more than the required amount) was a significant predictor of growth for children in the low-frequency classrooms (i.e., two-times per week). Children who received an increase in dosage and frequency (i.e., four-times per week) did not show statistically more growth.

Although treatment research relative to aspects of intensity reports much variability and inconsistent relations to children’s outcomes, recent surveys of SLPs in the public schools indicate extreme homogeneity of services. Studies by Mullen and Schooling (2010) and Brandel and Loeb (2012), using survey information per SLP report, indicate that the vast majority of children receive speech-language therapy one to two times a week for 20-30 minutes. In the Brandel and Loeb (2012) study, SLPs reported that their primary determinant of speech-language therapy intensity are child-level factors; however, regression analyses showed that child language abilities were not predictive of the amount of speech-language therapy received, which is surprising, given the legal charge to provide individualized education plans to each child based on need.
Theoretical papers within communication disorders highlight the importance of considering frequency as a construct relative to speech-language therapy (Warren et al., 2007), and the study findings by McGinty and colleagues offer empirical evidence that frequency may need to be considered concurrently with other aspects of intervention. However, information on how frequency relates to children's language gain in the public schools is less understood for children with LI. Therefore in the current study, frequency will be conceptualized in terms of the total number of sessions and the total amount of time children with LI spend in therapy over an academic year.

**Quality Features.** Research in the educational and psychological literature has established strong associations between aspects of quality in children's classrooms and their academic and language outcomes (Burchinal et al., 2008; Curby et al., 2009; Early et al., 2007; La Paro, Hamre, Locasale-Crouch, & Pianta, 2009; Mashburn et al., 2008; Pianta, Belsky, Vandergrift, Houts, & Morrison, 2008). Typically, quality is conceptualized as both the depth and sophistication of instruction provided (i.e., instructional support) as well as the degree of warmth, concern, and responsiveness children experience with their teachers (i.e., emotional support; Pianta et al., 1995). Theoretically, children situated in learning environments characterized by high instructional and emotional quality may be in better position to learn than peers in low quality situations. Children in high quality environments, including speech-language therapy settings, may have increased access to elements of speech-language therapy. Classrooms, or in this study speech-language therapy settings, that create an environment
characterized by warmth, compassion, and care may allow children to take risks and engage in therapy activities, mechanisms that arguably are influential in promoting children's growth. Provision of high instructional support is even more intuitively appealing in the realm of speech-language therapy - children who have access to stronger instructional support during speech-language therapy may benefit more from challenging tasks and concepts than peers in low instructional quality settings. Although very few studies have investigated the role of quality within speech-language therapy sessions (but see Ebert & Kohnert, 2010; Schmitt, Justice, & O'Connell, in review), there is strong research from educational and psychological literature to support the role of quality features on children's outcomes. In the following sections, the importance of quality features to classrooms and counseling treatment settings, and potential relevance to speech-language therapy, is discussed.

**Instructional Quality.** Classrooms high in *instructional quality* are characterized by strong concept development, language modeling, and quality feedback. Teachers who utilize high instructional quality ask open ended questions and relate new knowledge to previously learned concepts. Explanations relate to the children's lives and classroom experiences, and the feedback they provide children promotes higher order thinking. Classrooms low in instructional quality, on the other hand are focused more on task completion and basic concept acquisition. Teachers utilizing low instructional quality generally ask yes/no or closed-ended questions, don't relate new knowledge to children's lives or prior learning. In these classrooms, minimal to no feedback is provided for
incorrect responses, and children are rarely given opportunity to think through an inaccurate response to try again.

A study by Burchinal and colleagues (2008) investigated the quality of 929 preschoolers attending state-funded preschool programs across six states. Their results found a significant, positive association between the instructional support children received in preschool and kindergarten and their language and reading skills at the end of kindergarten. The instructional quality of kindergarten classrooms had a significant association with language outcomes in kindergarten ($\beta = .11, p < .01$). More interestingly, as the instructional quality of preschool classrooms increased, so did children's scores in kindergarten across language ($\beta = .08, p < .05$) and reading ($\beta = .09, p < .05$) after controlling for kindergarten instructional quality. Results of this study suggest that instructional quality not only has an impact on children's current growth, but that instructional quality continues to impact children's development even after children have matriculated to new settings. That said, study findings should be interpreted with some caution, as researchers did not account for the nested nature of the data through hierarchical linear modeling, and as such, a risk for inflated significance values is high.

Additionally, a study by Curby et al. (2009) considered profiles of quality indicators for each child (n = 2,967) nested within 701 preschool classrooms. Findings suggest a strong relation between quality of instruction and children's gains in language over the academic year as compared to children situated in low quality classrooms (effect size of .19). Interestingly, their findings suggested one particular aspect of instructional
quality, namely concept development, may be a significant predictor of language gains, as children within classrooms that included high instructional quality in the area of concept development, with moderate levels of emotional quality, gained more than children in classrooms with high instructional quality and high emotional quality, but overall lower scores on aspects of concept development, respectively. This study lends additional support to the significant relation between instructional quality and language growth; however, this study measured language through a single indicator of vocabulary (PPVT). More information is needed to understand how instructional quality relates to other aspects of language as well as speech-language therapy provided to children with LI.

**Emotional Quality.** Classrooms high in *emotional quality* are characterized by a strong positive climate and teachers who are sensitive and responsive to the needs of children. Teachers in high emotionally-supportive classrooms anticipate children's needs, create an environment that is overall positive and enjoyable, and respond individually to each child. On the contrary, classrooms low in emotional support are characterized by negativity and chaos. Relationships between teachers and children are filled with conflict and the individual needs of the children are often unmet. Researchers suggest that rather than exerting direct influence on children's outcomes, that the quality of emotional support may be an indirect feature of treatment; classrooms high in emotional quality may provide a conduit for children to engage with other features of the environment important for growth (Entwistle & Hayduk, 1988; Hamre & Pianta, 2001).
This may be especially significant to consider for children with LI, as studies suggest that children with lower language abilities may be at risk for lower emotional quality experienced in the classroom as compared to typically-developing peers (Rudasill et al., 2006). Rudasill and colleagues (2006) investigated the link between children's language skills and the quality of their emotional classroom environment for 99 at-risk preschoolers. Children with weaker language skills as measured by children's grammatical complexity, and bolder personalities experienced lower quality of emotional support within their classroom (i.e., more conflict) than peers with stronger language skills. Once teacher effects were controlled for, children's language and temperament accounted for 4% of the amount of conflict experienced. A study by Schmitt et al. (2012) of at-risk preschoolers found that children nested within emotionally-supportive classrooms gained more in grammar over the academic year than peers in low emotionally-supportive classrooms. Research in counseling psychology suggests that the association between quality and outcomes may relate to treatment settings as well (Beutler, Forrester, Gallagher-Thompson, Tompson, & Tomlins, 2012; Del Re, Fluckiger, Horvath, Symonds, & Wampold, 2012; Watson, McMullen, Prosser, & Bedard, 2010).

Two meta analyses have been conducted to determine if emotional quality (termed therapeutic alliance) related to outcomes and if so, under what conditions. The first meta analysis was conducted by Horvath and Symonds (1991). These investigators identified 24 studies with rigorous design methodologies to consider the relation between quality and outcomes. Their research found an association between quality of the
therapeutic alliance and outcomes across all studies, with an overall effect size of .26. This relation was robust to all other treatment parameters, including length of treatment and patient diagnosis. A second meta analysis, conducted by Fluckiger, Del Re, Wampold, Symonds, & Horvath (2012) included 201 articles for synthesis. Specifically, these researchers were interested in the nature of the association between quality of the therapeutic alliance and outcomes. Their primary finding was that the quality of the therapeutic alliance was a robust predictor of patient outcomes, irrespective of research design, treatment parameters, or methods of outcome measurement.

While these studies out of the counseling sciences offer some evidence that the quality of a treatment setting may be instrumental in outcomes, the extent to which this information generalizes to speech-language therapy is quite restricted. For one, these studies primarily involve adult treatment, in which the nature of the relationships might be quite unique from child-adult relationships. Second, many of the studies investigated in the meta analyses used patient and/or therapist report as a measure of both the quality of the alliance as well as the outcomes. Use of personal report comes with inherent bias that may have influenced study findings. More research specific to speech-language therapy for children with LI, incorporating direct measures of quality as well as outcomes, is needed to determine whether this feature of speech-language therapy is relevant to children's growth.

To date, we are aware of only two studies that have investigated the role of speech-language therapy quality on language outcomes for children with LI. The first
study, conducted by Ebert and Kohnert (2010) was a descriptive survey of SLPs in one Midwestern state. Their study was conducted in two phases: the first phase sought input from 70 participants (58 SLPs, 3 fellows, and 30 graduate students) to determine features of speech-language therapy that were deemed important in the treatment process. The second phase utilized information generated from the first study to create an online survey. 160 respondents (152 were certified SLPs) rated 25 features of speech-language therapy on a 1-5 scale of importance (1 = low importance, 5 = high importance) relative to influencing outcomes. Subsequently, all respondents were asked to identify the top three features of speech-language therapy that were the most influential in therapeutic outcomes. Of the 160 participants, 80 selected rapport between the SLP and client as one of the top three features of successful speech-language therapy. Additionally, rapport received a median rating of 5 across the sample.

This study was descriptive in nature and suggests that SLPs value the quality of their relationships with those receiving speech-language therapy as a critical factor for outcomes, but doesn't confirm whether or not this plays a role in language growth for children with LI as no observational data was used. The original survey was guided by a mix of participants, some with no professional experience, which strongly influenced the responses on the survey. In contrast, Schmitt, Justice, and O'Connell (in review) investigated the association between emotionally-supportive speech-language therapy sessions and children's gain in vocabulary for children with LI receiving services in the public schools. Their study revealed null findings; however, it is unclear if a significant
relation would have been found for other areas of language (e.g., grammar, pragmatics) or other aspects of quality (i.e., instructional quality) relative to children's language growth.

Research in educational and counseling literature identifies strong associations between aspects of quality of treatment and children's outcomes; however, these studies offer little evidence for the relation between children's experiences in speech-language therapy settings and language growth. Additionally, many of the studies investigated this association for at-risk children; far less is understood about the impact of quality for children with LI. Given the significant relation between quality and language outcomes, I hypothesize that quality indicators of speech-language therapy sessions may play key roles in determining children's language outcomes over an academic year. Specifically, three indicators of instructional quality (i.e., Concept Development, Quality of Feedback, and Language Modeling) and four indicators of emotional quality (i.e., Positive Climate, Negative Climate, SLP Sensitivity, and Regard for Student Perspective) will be investigated.

**Interactive Effects of Features of Speech-Language Therapy**

Speech-language therapy is multidimensional, comprising a number of different components, and as such, characterization of relevant features of speech-language therapy may not be complete without consideration of interactive influences among these features. Although the prior discussion of features of speech-language therapy situated each as unique and independent constructs, it may well be that these features operate in a
multi-faceted, interconnected way. Intuitively, aspects of speech-language therapy may not be mutually exclusive. A child who receives individualized speech-language therapy at high levels of cumulative intensity may derive different outcomes compared to a peer with equal intensity levels who receives speech-language therapy within large group settings. Children may be situated in instructional environments, known to influence children's gains (Burchinal et al., 2008; Mashburn et al., 2008), but if the targets and techniques fail to address their primary language needs, then high instructional quality may not be enough to change their language trajectory. In fact, instructional literature across related disciplines supports this notion of interactive influences across aspects of treatment (Connor, Son, Hindman, & Morrison, 2005; Goldfried & Davila, 2005; Kraft, Puschner, & Kordy, 2006; Mashburn et al., 2008; McGinty, Justice, Piasta, Kaderavek, & Fan, 2012; NICHD-ECCRN, 2002).

Research in educational sciences suggests that features of instruction may exert differential influence on children's outcomes. For instance, a longitudinal study conducted through the NICHD-ECCRN (2002) investigated the interactive effects of structural (i.e., group size, training) and process (i.e., quality of care) features of child care on outcomes for 813 preschool children. Their study not only showed a significant effect between features of instruction (i.e., structural processes impacted process features, such that as child-teacher ratio increased, the quality of process features decreased, $\beta = -.021, p < .01$) but that structural features mediated the relation between process features and children's outcomes. Specifically, the model representing structural features (child-
teacher ratio) as exerting indirect influence on children's outcomes ($\beta = -0.10, p < 0.01$) and process features exerting direct influence ($\beta = 0.10, p < 0.01$) was the best fitting model.

Mashburn and colleagues (2008) found a similar pattern of influence. They investigated aspects of classroom infrastructure (list what these were) and quality of instruction on the language and literacy outcomes of 2,439 preschoolers. Even though prior studies had shown structural processes to contribute unique influence to children's outcomes (e.g., Bryant, Burchinal, Lau, & Sparling, 1994; NICHD-ECCRN, 1999). Mashburn et al. (2008) found structural processes to exert indirect influence on outcomes when considered concurrently with quality features of the environment.

Additionally, studies in related fields suggest that features of instruction may function interactively to impact children's growth. For instance, a study by McGinty et al., (2012) investigated the effect of print instruction for 379 preschoolers within 59 preschool classrooms. They found interactive effects between the quality of the environment and teacher-directed, explicit instruction. Exposure to explicit instruction was a positive predictor of children's outcomes for those nested within low quality classrooms. Explicit instruction was less significant for children within high quality classrooms. As another example, La Paro et al., (2009) found that structural aspects of a child's environment (including teacher-child ratio and length of school day) influenced the quality of that environment. Classrooms with a smaller ratio of children to teachers and that met for fewer than 3.5 hours per day demonstrated higher levels of quality than classrooms with higher ratios that met for a greater number of hours. Relatedly, studies
within the counseling literature have found features of treatment to not only exert bidirectional influence on each other (higher quality relationships result in more effective use of techniques and vice versa; Goldfried & Davilla, 2005) but also demonstrate interactive influence on client outcomes. A study by Kraft et al., (2006) found that the intensity of treatment sessions predicted outcomes only for a particular treatment approach (i.e., psychoanalytic psychotherapy). For the other approaches investigated (psychodynamic psychotherapy and cognitive behavioral therapy), intensity was not a significant predictor of changes in client outcomes.

The nature of influence of features of speech-language therapy for children with LI is less understood. Most of the treatment research relevant to LI has manipulated on aspect of speech-language therapy (e.g., intensity) and controlled for other aspects (e.g., location of services, dosage, techniques; see Bellon-Harn, 2012; Bos & Anders, 1990; Gillam et al., 2012; Proctor-Williams & Fey, 2007; Throneburg et al., 2000; Ukrainetz, 1998 for examples). Additionally, not all features of speech-language therapy are accounted for. For example, a study by Yoder and colleagues (1995) investigated the use of expansions as a technique influential in children's mean length of utterance, controlling for directiveness (child led), materials (story books), and location (lab-based therapy room) but did not account for dosage (each child received differing amounts of the technique) or quality of the interactions. A study by Bellon-Harn, (2012) specifically investigated the influence of concentrated versus distributed speech-language therapy frequency on language gain for 12 preschoolers with LI, controlling for techniques
employed (cloze procedure, expansions, models) and dosage of that technique (9-11 times per minute). Finding no significant difference between the two frequencies, Bellon-Harn suggests that concurrent manipulation of several features of speech-language therapy (to include techniques and dosage) may be necessary to fully understand the relation between discrete aspects of speech-language therapy, such as frequency, and children's outcomes. To date, the speech-language community has preliminary evidence of what features of speech-language therapy may function as active ingredients within speech-language therapy, but little empirical understanding of the interplay among these features of speech-language therapy on children's outcomes. In order to fully capture active ingredients within speech-language therapy, we must not only consider the unique aspects of features of speech-language therapy, but their interactive contributions as well.

**Summary and Research Aims**

SLPs have the primary responsibility of designing and implementing individualized, appropriate education plans for children with LI, making multiple decisions regarding the specific structural, process, and quality features of speech-language therapy to apply to a given child. The paucity of research guiding these decisions is concerning, and limits the extent to which SLPs can utilize the extant research to inform their clinical decisions. Existing research suggests that speech-language therapy has value in bolstering children’s language growth (e.g., Gillam et al., 2008; Leonard et al., 2006; Nye et al., 1987; Tyler et al., 2003; van Kleeck et al., 1998), but little evidence exists to discern the active ingredients of speech-language therapy
relative to language growth. Identification of these active ingredients is a critical component of speech-language therapy and applied research: SLPs should know which aspects of speech-language therapy are more likely to influence language growth when planning effective therapy and researchers need direction in which active ingredients should be systematically manipulated to empirically determine effective speech-language therapy practices. Given the long-term adverse impacts of LI for children with LI (Johnson et al., 2010), and evidence showing that few children with LI are likely to experience maturational resolution of their impairment (Conti-Ramsden et al., 2001; Law et al., 2008; Tomblin et al., 2003), the need for understanding the active influences of speech-language therapy responsible for change in language skills is not only a matter of researcher-interest, but a matter of public need.

A small corpus of treatment studies offer empirically-based suggestions of features of speech-language therapy that may act as active ingredients - the features responsible for change. However, most of these studies were conducted by researchers in lab-based settings and often with researcher-determined populations. The conditions of treatment along with limitations in design features and lack of external validity drastically limit generalization to clinically-based populations. More information is needed on how these features of speech-language therapy function for children within the public schools being served by SLPs. This study will take a first look within speech-language therapy in the public schools, in a business-as-usual framework, utilizing direct observational tools to capture the multi-dimensional nature of language speech-language therapy for clinical
populations of children with LI, and as such, is uniquely situated to inform current theory, practice, and research governing speech-language therapy efforts for children with LI. To that end, the current study has two primary aims:

1. To characterize language speech-language therapy in the public schools for children with LI, and

2. To determine the extent to which features of speech-language therapy independently and interactively predict children's language gain over an academic year.
Chapter 3: Methods

Participants

Participants in this study included 73 SLPs and 233 early elementary children from rural and urban school districts in Midwestern states. These participants represent a subset of three cohorts (2009-2010; 2010-2011; 2011-2012) of a study investigating speech therapy experiences for children with LI in the public schools. Of the original 294 children who participated in the larger study, only those children who had an identified language need (as defined by one or more IEP goals in language and/or falling at least 1 $SD$ below the mean on one or more language subtests), nonverbal IQ above 70, and who completed the full year of study participation were included in the present study.

SLP recruitment. Study personnel recruited SLPs for participation in the larger study prior to the beginning of each cohort’s academic year. The primary aims of the study as well as requirements for participation were widely advertised through brochures, local and state association conferences, and district SLP meetings. All interested SLPs voluntarily contacted study personnel, at which time a systematic process for enrolling SLPs in the study was utilized. To be considered for participation, each SLP had to anticipate a caseload of approximately five early elementary children with LI. As a first step towards study enrollment, study personnel worked with each SLP to secure district-level approval. Once district approval was received, study personnel sought consent from
each SLP who anticipated a minimum of five early elementary children with LI on their caseload for the participation year. As recruiting efforts occurred prior to the academic year, the time when school placements and caseloads are finalized, SLP consent was conditional upon children participation. In some cases, SLPs who originally consented to participation were dropped from the study if they weren't able to meet all of the above criteria.

**SLP demographics.** SLPs in this study were primarily female ($n = 71; 97\%$), all had a state license in speech-language pathology, and the majority held a Certificate of Clinical Competence from ASHA ($n = 68; 93\%$). The SLPs represented a range of experiences ($M = 16$ years; $SD = 11$ years; $Range = 0$ to 36 years) and were primarily Caucasian ($n = 66; 90\%$) with other ethnicities represented, including African American ($n = 5; 7\%$), Hispanic ($n = 1; 1\%$) and other ($n = 1; 1\%$).

**Child recruitment.** Once SLPs consented for participation, study personnel utilized a systematic process to enroll three to five children per SLP caseload who met inclusionary criteria for participation. Criteria included: children who were in kindergarten or first grade (for cohort 3, 2nd grade children who turned 8-years-old during the school year were also considered for participation), had an IEP for language, and were currently receiving direct services in the public schools. Children were recruited for participation in the following manner:
1. SLPs identified potential children for participation using general inclusionary criteria provided by study personnel. SLPs sent information regarding the study as well as consent forms to caregivers of all potential participants.

2. For children for whom caregivers gave consent, SLPs then completed a Child Screening Questionnaire (CSQ) on up to 10 children, reporting the child's primary diagnosis, any comorbid diagnoses, hearing screening information, age, and grade level. The SLP sent the CSQ and consent forms to the primary investigator of the study.

3. The primary investigator then prioritized consented children to ascertain three to five children per SLP caseload who best fit criteria for participation. Priority was given to children with primary LI, followed by children with comorbid diagnoses who were expected to be able to participate in all study procedures.

**Child demographics.** All children had an IEP and were currently receiving speech-language therapy from an SLP in the public schools. This study was specifically interested in characterizing speech-language therapy experiences for children with LI in the public school systems. As previously discussed, children with LI are a very heterogeneous population. To adequately characterize business-as-usual therapy experiences, all children with LI, both primary and secondary LI, were included. The majority of children had a primary language disorder (i.e., no concomitant diagnoses; \( n = 182; 78\% \)). The other 18% \( (n = 43) \) had the following concomitant diagnoses: attention
deficit disorder (n= 20), autism (n = 15), epilepsy (n = 3), hearing loss (n = 2), and other (n = 3).

Children's mean age at the beginning of their year of participation was 76 months (SD = 8.57; range = 59 to 96 months); 64% of children were male (n = 150) and 36% were female (n = 83). Forty percent of the children were in kindergarten (n = 94), 58% were in first grade (n = 134) and 2% were in second grade (n = 5) at the time of participation. The children represented a range of ethnicities including Caucasian (n = 126; 54%), African American (n = 23; 10%), Hispanic (n = 8; 3%), Asian (n = 5; 2%), other (n = 10; 4%), with 26% unreported (n = 60). Additionally, participating children represented a wide range of socio-economic status indicated by both family income and maternal education. For family income, 20% of participants' families earned less than $25,000 (n = 47), 21% earned $25,001 - $50,000 (n = 49), 14% earned $50,001 - $75,000 (n = 33), 21% earned $75,000 or more (n = 48), and 24% were unreported (n = 56). For maternal education, 10% of participants' mothers did not have a high school diploma (n = 23), 33% had a high school diploma and/or some college education (n = 77), 28% had an associates or bachelors degree (n = 65), 9% had education or degrees beyond bachelors (n = 22), and 20% were unreported (n = 46).

Study Procedures

The primary goal of the study was to capture business-as-usual speech-language therapy experiences for children receiving services in the public schools. With that aim in mind, the following study procedures specific to SLPs and children are described. SLPs
attended a 90-minute orientation session prior to the beginning of the school year that explained all study requirements and processes. SLPs had three main tasks for this study:

1. SLPs provided study personnel with participating children's IEPs at the beginning of the year. Note that caregivers approved provision of these IEPs with study consent.

2. SLPs completed weekly therapy logs for the duration of the academic year, detailing comprehensive information about each child's speech-language therapy and contact with caregivers and teachers. Study personnel provided each SLP with a schedule and all materials necessary to complete and return the therapy logs (i.e., weekly forms, pre-paid envelopes).

3. SLPs captured five representative speech-language therapy sessions on video for every participating child. Study personnel provided SLPs with a video-taping schedule (five, 2-week taping windows spaced throughout the academic year) and all materials necessary for the video tapping (video equipment, stamped envelopes to submit taped sessions).

All participating children completed a battery of assessments with a trained assessor in the fall and spring of their cohort year. All assessments were conducted in the child's elementary school on two separate days, lasting 45 minute each day. All assessors completed comprehensive training protocols and met reliability standards prior to testing in the field. The following three-phase training process was utilized: (a) assessors
completed a self-directed online training module that provided key administration and scoring guidelines for each subtest, (b) assessors participated in a mock assessment with senior research staff; assessors were required to score a minimum of 80% on administration and scoring accuracy, and (c) assessors who passed the mock assessment then conducted a battery of assessments with study participants under direct supervision. Research staff conducted all assessment procedures (SLPs were not involved in testing) and scores on the assessments were used for research purposes only.

Measures

Information for the present study was informed by child language measures as well as information specific to each therapy session.

Child Language Measures. To capture children's language abilities in the fall and spring of the academic year, a battery of language assessments were administered. Specifically, children's semantic and morphosyntactic abilities were assessed using subtests from the Clinical Evaluation of Language Fundamentals-4 (CELF-4; Semel, Wiig, & Secord, 2003) and the Woodcock-Johnson III Tests of Achievement (WJ-III; Woodcock, McGrew, & Mather, 2001). As the participants in this study had LI and therefore presented with deficits across a range of language domains, this study measured children's abilities across a range of language domains (see below). Scores from the following measures were used to create a language latent variable (an omnibus measure of language) for both fall and spring.
Concepts and Following Directions. The Concepts and Following Directions subtest from the CELF-4 (Semel et al., 2003) assesses children's understanding of time, sequence, size, and color concepts. For this subtest, children are asked to follow directions incorporating elements of each with increasing complexity. Responses are scored (1) for accuracy and (0) for inaccuracy until the child reaches a ceiling of seven or reaches the end of the subtest.

Word Structure. The Word Structure subtest from the CELF-4 (Semel et al., 2003) tests children's expressive use of free and bound morphemes. Children are asked to complete prompts from the examiner (e.g., "This is one horse. These are two ______ (horses)"). Responses are also scored (1) for accuracy and (0) for inaccuracy; all 31 items are administered for this subtest.

Recalling Sentences. The Recalling Sentences subtest from the CELF-4 (Semel et al., 2003) assesses children's use of morphological and syntactic structures. Children are asked to repeat sentences from the examiner verbatim. Responses are scored (3) for no errors, (2) for one error, (1) for one to three errors, and (0) for more than 3 errors.

Formulate Sentences. The Formulated Sentences subtest from the CELF-4 (Semel et al., 2003) assesses children's formulation of syntactically appropriate sentences. Children are given a word and a picture prompt and asked to formulate a sentence using the word that applies to the picture. Responses are scored (2) for syntactically and semantically correct sentences, (1) for sentences with one error, and (0) for incomplete sentences or sentences with more than one error.
**Picture Vocabulary.** The Picture Vocabulary subtest from the WJ-III (Woodcock et al., 2001) was administered to assess children's expressive vocabulary skills. For this subtest, children are shown a sequence of pictures of increasing complexity and asked to label each. Responses are scored (1) for accuracy and (0) for inaccuracy.

**Therapy Sessions.** Data pertaining to children's speech-language therapy experiences were extracted from two primary sources: weekly therapy logs and videotaped recordings of therapy sessions. Procedures pertaining to each of these sources are described below.

**Therapy Logs.** SLPs tracked aspects of speech-language therapy for each participating child on a weekly basis by completing "therapy log" sheets. At the onset of the study, each SLP was provided with one therapy log for each week of the study (an average of 35 weeks per cohort). Each week, the SLP listed each child's name, aspects of provision of speech-language therapy (days, times, cancelations, absences, location), grouping information (i.e., number of other peers in the group, whether or not those peers had IEPs), and any contact with parents or teachers. SLPs mailed these logs to the research team every 4-6 weeks with envelopes provided at the onset of the study. Once the therapy logs were received in the lab, all logs were de-identified to maintain confidentiality. See Appendix B for an example therapy log.

**Therapy Videos.** As part of the larger study, each SLP captured five therapy sessions across the school year for each participating child. SLPs were asked to capture representative, business-as-usual sessions on video; therefore, more than one child could
have been captured in one video-taped therapy session. As a result, each SLP submitted as few as one video or as many as five videos at each time point. Once the videos were received by study personnel, each video was transferred to a secure server and any children not consented for the current study were edited out to maintain confidentiality. Videos were then coded using two coding systems: LIOS (Language Intervention Observation Scale; LIOS, Justice & Schmitt, 2010) and the CLASS (Classroom Assessment Scoring System; CLASS; Pianta, LaParo, & Hamre, 2007).

**LIOS.** The LIOS was designed to capture key aspects of speech-language therapy, including Direction (who is leading and participating in the session), Talk Time (who is speaking), Materials (the physical tools used during the session), Target (the dimensions of language addressed) and Techniques (the scaffolding strategies SLPs use during the session; See Table 1 for a comprehensive list of behavior codes). Due to the specificity required to capture moment-by-moment coding of these sessions, each therapy session was coded in three phases and took approximately 3-4 hours to code. Therefore, for this study, two videos from the fall and winter time points were coded for each child.

To establish reliability, coders completed a comprehensive training and reliability program prior to coding that averaged 40 hours in length. The training program was divided into four phases designed to be largely self-guided learning of the coding scheme as well as the coding software program. For the first phase, trainees completed a systematic process of learning the codes for each behavior group. The following steps were completed for each behavior group. First, trainees read the corresponding pages in
the 70 page LIOS manual detailing specific definitions and coding criteria for each code and reviewed a power point presentation that presented example video clips of each code. Second, trainees completed a quiz for that behavior group to ensure mastery of the most distinctive features of the behavior group. Third, trainees completed two practice video clips, coding only the behavior group being studied, and compared their codes to a master code.

In the second phase, trainees began to integrate the behavior codes; trainees coded two practice videos, once for Direction, Materials, and Talk Time and a second time for Targets and Techniques. Once coded, the trainees compared their codes to a master code with the intent of calibrating their coding decisions to the Master coding scheme.

In the third phase, trainees coded three 5-minute video clips independently; each of these clips was then compared to the Master codes by the lead coder and calculated for mock-reliability scores. Trainees conferenced with the lead coder on any behaviors that were unreliable and had the opportunity to buddy code with reliable coders (i.e., observe a reliable coder coding in real-time and ask questions pertaining to their coding process). Trainees completed a minimum of three and a maximum of six mock reliability videos.

In the final phase, trainees completed reliability testing. For reliability, trainees had to meet standards on three videos (i.e., overall kappa of .80 and kappa of .70 or higher for each behavior group). Trainees who failed to meet reliability standards were reassigned to other project needs. To ensure inter rater reliability of the codes, 10% of all
videos will be double coded for an overall kappa of .75 which is considered high (Landis & Koch, 1977).

**Quality Coding.** In addition to the LIOS coding, two therapy videos per child were coded for instructional and emotional quality using the CLASS (Pianta, LaParo, & Hamre, 2007). The CLASS, an observational tool designed to capture aspects of children's classroom environments, was modified for use in the current study. Full audio and video taped sessions lasting a minimum of 10 minutes were coded for quality. Coders rated each therapy video across four categories of Emotional Quality (i.e., Positive Climate, Negative Climate, SLP Sensitivity, and Regard for Student Perspectives) and three categories of Instructional Quality (i.e., Quality of Feedback, Concept Development, and Language Modeling) on a 7-point likert scale, with 1 representing low occurrence of quality indicators and 7 representing high occurrence. For the purposes of the present study, quality ratings were coded for the same two therapy sessions that were coded using the LIOS to achieve consistency across study measures.

Prior to coding, all coders were trained by a certified CLASS trainer over a two-day seminar and passed a reliability test (i.e., 80% or better on 5 master-coded videos). Ten percent of all therapy videos were double coded to ensure reliability of the therapy videos for a within-one agreement of .87.

**Features of Speech-Language Therapy.** Using the data sources described above, the following components of therapy were extracted for use in the current study.
and calculated for each participating child. See Table 2 for an overview of study variables.

**Service Delivery Models.** The therapy setting (i.e., speech room, classroom, special education room, other location) as well as groupings (i.e., number and peer grouping of other students present in a therapy session) and collaboration were extracted from the therapy logs to capture aspects of service delivery models.

**Setting.** For therapy setting, the total number of therapy sessions that occurred in each setting over the school year was calculated. Additionally, the primary setting for each child was determined by calculating percentages for each setting. The setting in which children experienced 70% of sessions or more was identified as the primary setting.

**Grouping.** Several different variables were computed to represent grouping of therapy sessions. Group size was calculated by averaging the number of peers present in each participant's therapy session for the year, as indicated on the weekly therapy logs. Additionally, the total number of sessions that were individual, small group, large group, or extra large groups were determined, as was a primary group size (in a similar method to determining primary setting). Group composition was calculated by determining the number of therapy sessions over the year that included peers with and without IEPs, as indicated on the therapy logs.
Collaboration. For collaboration, I used the categorical information provided on the therapy logs to calculate a total number of weeks in which SLPs contacted the classroom teacher through one or more methods.

Materials. To capture materials used within therapy sessions, information from two video-taped sessions was used. Specifically, I extracted the materials used for each session, as coded from LIOS, and determined the number of sessions that used each material. Additionally, I calculated the total number of different materials used within each session.

Direction. For Direction, I was interested in the amount of time spent in joint: SLP-led interactions. To determine this variable, I extracted the total time spent in joint: SLP-led interactions for each therapy session as coded from LIOS. This total was aggregated across two therapy sessions for each participant to arrive at an average amount of time and a total sum of time spent in joint: SLP-led interactions.

Targets. For Targets, I was interested in time spent on language-based targets for this population of children with LI. The total time spent on language targets (i.e., grammar, vocabulary, discourse, communicative functions, narratives, listening comprehension abstract language, metalinguistics, literacy) as determined from LIOS-coded videos was summed for each therapy session. These totals were then aggregated across two therapy sessions for each participant to determine a total time in language targets and an average time in language targets for two sessions. Time spent on speech-
related targets (articulation/phonology, fluency, voice), management, or null tasks were not included.

**Techniques.** To capture this construct, individual techniques as well as categories of techniques (evocative and non-evocative) identified in the literature review as relevant to children's language outcomes were measured. From the coded videos, I calculated the number of times each technique was used per therapy session. Then, a total count of evocative and non-evocative techniques was calculated and summed across two therapy sessions.

**Frequency.** To determine the frequency of therapy for each participant, the total number of sessions and total amount of time was calculated for each child. To calculate the total number of sessions, a frequency count was determined from the therapy logs by totaling the number of sessions a child experienced each week across the school year. Additionally, the total amount of time spent in therapy was summed across the entire year. Total amount of time was reported in hours and minutes.

**Instructional Support.** To determine elements of instructional quality for each participant, the scores for Concept Development, Quality of Feedback, and Language Modeling were each averaged between two sessions.

**Emotional Support.** Similarly, to determine the emotional quality for each participating child, the scores for Positive Climate, Negative Climate, SLP Sensitivity, and Regard for Student Perspective were averaged between two therapy sessions.
Analytic Strategy

The current study addressed two main research aims relevant to children’s experiences in speech-language therapy in the primary schools. Analyses specific to each research aim are detailed below.

Research Aim 1. As an initial step in investigating the first research aim, "To characterize speech-language therapy in the public schools for children with LI", descriptive analyses were run on all study measures. Study measures comprised continuous variables measured at static points in time, categorical variables measured at static points in time, and continuous and categorical variables measured across time points. For all continuous measures, means, standard deviations, and ranges were calculated and assumptions were assessed. For all categorical variables, frequency counts were determined. Subsequently, the appropriate descriptive measures were calculated for all aggregated study variables. Correlations were run and analyzed for significance, directionality, and strength. Additionally, assumptions were tested through statistical indices as well as evaluation of scatter plots and histograms.

As a second step in our first research aim, an exploratory factor analysis was conducted to determine the underlying factor structures for individual features of speech-language therapy. As no study to date has identified factor structures associated with speech-language therapy, exploratory factor analysis was the most appropriate analytic tool. First, all individual features identified in this study were entered as a set. Second, multiple runs of the data were conducted, each with an adjusted number of factors. After
each subsequent run, I assessed model fit by analyzing the standardized weights, or loadings, between the variables and the factors as compared to the previous models. Any identified factors were analyzed to determine if the factor structures were valid indicators of the variables and made theoretical sense (as opposed to statistical artifacts).

Next, to improve the interpretation of the factors, I conducted oblique rotations, allowing for the factors to be correlated. As the correlations were greater than .3 or .4, I retained the correlations and used this model to determine factor scores. These scores were used as predictors for the second research aim.

**Research Aim 2.** To investigate my second research aim "To determine the extent to which features of speech-language therapy independently and interactively predict children's language growth over an academic year" multiple regression analyses were used to determine the extent to which features of speech-language therapy predicted language gain. Although the children were nested within SLPs (3-5 children per SLP), children were not necessarily nested within the same therapy sessions and could have received very different therapy experiences across the academic year. As such, the population of children for this study were more accurately represented as independent participants rather than as a cluster within SLPs. However, the fact does remain that three to five children were served by the same SLP and were not completely independent. Potential impacts on study findings and interpretations are discussed in the results section.
Prior to creating multiple regression models, a latent variable for language gain was created using a multi-step process. First, factor scores were created for both fall and spring, using five observed measures of language (Concepts and Following Directions, Word Structure, Formulated Sentences, Recalling Sentences, Picture Vocabulary). Measurement invariance was tested to ensure that the indicators of language and the factor structures were the same at both fall and spring time points. To test for invariance, two models were compared. First, a Confirmatory Factor Analysis was conducted in which each language indicator for fall and spring were entered into the model; the factor loadings for fall and spring were constrained to be equal. Model fit indices indicated a CFI of .990, RMSEA of .049 and $\chi^2$ of 51.234 ($df = 33; p = .022$). As the next step in testing measurement invariance, a Confirmatory Factor Analysis was run in which factor loadings for fall and spring were free to vary. Model fit indices indicated a CFI of .99, RMSEA of .051, and a $\chi^2$ of 46.760 ($df = 29; p = .019$). To test for invariance, model fit indices were compared. The difference in CFI between the two models was .001, RMSEA differed by .008, and the $\chi^2$ difference test was 4.47 ($df = 4$), which was not significant ($p = .035$). The factor loadings were highly consistent between models (i.e., factor loading differences ranged from .002 to .02). Consequently, measurement invariance was found to hold for this sample.

Next, descriptive statistics were conducted for the outcome variable, language gain, along with all study predictors. Specifically, basic psychometric statistics (mean, standard deviation, and range) were calculated and all assumptions were assessed through
available statistics (e.g., skewness and kurtosis measures) as well as through observation of scatter plots and histograms. Subsequently, bivariate correlations were conducted between the outcome variable, Language Gain, and all predictors identified from research aim one.

Third, a multiple regression model was created with language gain as the outcome variable and factor scores for each of the five factors of language therapy entered as predictors to identify any main effects of these variables. Next, interaction terms were created for each combination of factors (a total of 10). The interaction terms were added into separate models, along with the corresponding factors, to identify if there were any significant interactions on language gain. Finally, significant individual features of speech-language therapy, as identified from correlational analyses, were entered simultaneously into a multiple regression model to identify any main effects of these variables on Language Gain.
Chapter 4: Results

The aims of this study were twofold: to characterize speech-language therapy experiences for children with language impairment and identify which features of therapy predict language gain. SLPs submitted weekly therapy logs across all three cohorts ($M = 35.66$ weeks; Median and Mode: 35 weeks; Range = 31 to 40). Over these 35 weeks, children in this study ($n=233$) experienced 10,819 therapy sessions over an academic year. SLPs video-taped five of these 10,819 therapy sessions for each participating child: videos from two time points ($n=358$) were coded for the present study. SLPs were asked to capture typical, business-as-usual therapy sessions on video and as such, these videos are considered representative of speech-language therapy sessions for each child. Because children were nested within SLPs, and SLPs were asked to capture business-as-usual sessions, children with the same SLP may have received therapy in the same session. As such, the total number of therapy sessions is less than two videos for every participating child. Nonetheless, the 358 videos represent two therapy experiences for every participating child. Data from therapy logs and therapy videos were analyzed to understand specific features of therapy as experienced by children with LI.
Research Aim 1: To Characterize Speech-Language Therapy in the Public Schools for Children with LI

The first research aim was to characterize therapy experiences for children with LI across eight identified features of intervention, including: service delivery model, materials, direction, targets, techniques, frequency, instructional support, emotional support. Assessment of skewness and kurtosis suggested that most variables fell within normal ranges, with the exception of variables of Service Delivery Models, including Individual, Large Group, Typical Peers, and Classroom that exhibited positive kurtosis. Positive kurtosis has the potential to limit variance in a particular variable; however, this is generally not a concern in samples over 100 (Tabachnik & Fikell, 2001).

Correlations between Language Gain and features of speech-language therapy are reported in Table 3. Several significant weak to moderate correlations were identified among features of speech-language therapy including Target and Quality of Feedback ($r = .445, p < .01$), Speech Room and Concept Development ($r = -.182, p < .05$), and 1-on-1 and Language Modeling ($r = .153, p < .05$). For example, a moderate relation existed between Target and Quality of Feedback, suggesting that as time targeting language increases, the quality of feedback in that environment also increases. An inverse relation was noted for Concept Development and Speech Room, suggesting that as the number of sessions occurring in the speech room increased, the degree of concept development decreased. Interestingly, Language Gain exhibited significant, albeit weak, correlations with only four features of therapy, including Large Group ($r = -.159, p = .019$), Typical
Peers ($r = .141, p = .044$), Evocative Strategies ($r = -.140, p = .032$), and Regard for Student Perspective ($r = .136, p = .040$). The following sections offer a comprehensive description of each feature of speech-language therapy.

**Service delivery models.** Service delivery models include three specific components including setting (where the therapy session occurs), grouping (number and type of peers in the therapy session), and collaboration (SLP’s contact with the classroom teacher). Intuitively, aspects of therapy settings and groupings are not mutually exclusive. For example, therapy sessions that occur in the general education classroom will necessarily also include more peers as well as typically-developing peers. To investigate the multicollinearity of these features, correlations were evaluated; significant correlations ranged from .132 to .694. Additionally, not all features of service delivery were correlated. These findings suggest that although features of service delivery are indeed related, multicollinearity may not be a concern. Therefore, in the following sections I describe discrete aspects of each component of service delivery models. Subsequently, a latent class analysis is reported to investigate any patterns of service delivery models experienced by children in the current sample.

**Setting.** For each speech-language therapy session, SLPs indicated if the session occurred in a speech therapy room, a special education room, a general education classroom, or other location. Of the 10,819 therapy sessions reported, the vast majority occurred in a speech therapy room (9,077; 83.89%). Another 850 sessions occurred in a
general education classroom (7.86%), 679 sessions occurred in another location (6.28%), and 103 occurred in a special education classroom [0.95%; 110 unreported (1.02%)].

To understand where each child received therapy services, the primary location for each child was calculated. The primary location was defined as the location for 70% or more of all therapy sessions. Similar to the session-level data, the majority of children primarily received therapy in a speech room (181; 77.7%) and only one child primarily received therapy in a special education classroom (0.4%). Four children primarily received therapy in a general education classroom (1.7%) and for five children, their primarily therapy location was designated as "other" (2.1%). Additionally, 42 children (18%) received therapy in a mix of locations, without one primary location. For instance, one child received 67% of sessions in a speech room and 33% of sessions in a general education classroom.

Grouping. Of the 10,819 sessions, therapy sessions included an average of 2.29 additional peers. The majority of sessions were small groups (i.e., 2 to 4 peers; 7,756 sessions; 71.69%). The remaining sessions included: 1,857 individual sessions (17.16%), 658 large groups (i.e., 5 to 7 peers; 6.33%); 452 extra large group sessions (i.e., 7 to 30 peers; 4.18%); 69 unreported (0.64%). To understand the extent to which an average child experienced each of these groupings, the majority grouping was calculated for each child (majority was defined as 70% of sessions or more). Similar to the overall percentages, more children primarily experienced small group therapy sessions than any other grouping (144 children; 61.8%) and only two children (0.9%) primarily received
therapy in extra large groups. Sixty-five children (27.9%) received a mix of therapy groupings. See Table 4 for complete results.

Of the sessions that included at least one peer \((n=8,893)\), SLPs indicated whether those peers were typically developing or had IEPs as an indicator of inclusive therapy sessions. A total of 7,094 sessions (79.77%) involved peers who also had an IEP (non-inclusive). The other 1,779 sessions (20%) involved typically-developing peers (inclusive); 20 sessions were unreported (0.23%).

*Latent Profile Analysis.* As previously indicated, the setting and grouping features of service delivery are not completely independent of each other. Latent Profile Analysis (LPA) was used to classify children into groups based on the service delivery model they received and consider how these features of service delivery operated together. To conduct the LPA, specific features of service delivery were used as indicators to capture the range of possible service delivery options. Percentage of sessions in a speech-therapy room and percentage of sessions in a general education classroom were included to capture setting. Due to the extremely limited occurrence of sessions in special education classrooms and other locations, these variables were not considered for the LPA. The average number of peers, percentage of 1-on-1 sessions, percentage of sessions with peers with an IEP and percentage of sessions with typically-developing peers were included to capture grouping information.

Seven models were created using these indicators, each one testing a different number of possible groups (2, 3, 4, 5, 6, 7, 8). To determine which model best fit the data,
several indices were used and compared, including the -2 Log Likelihood, the Akaike Information Criteria (AIC; Kaplan, 1989), the Bayesian Information Criterion (BIC; Kaplan, 1989), and entropy (Ramaswamy, DeSarbo, Reibstein, & Robinson, 1993). Table 5 presents all model fit results. All model fit indices suggest that the four-class model was the most optimal fit. The AIC, BIC, and -2LL indicate smaller values for the four-class model as compared to the three-class model, and much smaller changes in indices for the five-class model. These profiles and mean percentages for each indicator are depicted in Figure 1.

Each of the four models present a different combination of service delivery features. Children in Profile 1 (n=21) had an average of 52.61% of sessions that included typically-developing children, fewer sessions with other peers with IEPs (33.62% of sessions) or independent sessions (13.77% of sessions). They had an average of 8.24 peers in each session and experienced slightly more sessions in a general education classroom (53.49% of sessions) than in a speech room (41.94%). Children in Profile 2 (n=41) primarily experienced 1-on-1 sessions (62.63%) in the speech room (72.10%). Children in Profile 3 comprised the largest group (n=146); they primarily experienced therapy sessions with other peers who have an IEP (90.12%) in the speech room (92.88%), and may be considered to represent the more traditional speech-language therapy model. Children in Profile 4 (n=25) also experienced therapy primarily in the speech room (92.13%) but with a larger percentage of sessions including typical-
developing peers (69.50%), fewer sessions with only peers who also have an IEP (23.67%), and a higher average of peers (2.38) than children in Profile 3.

In sum, children who primarily receive therapy in the speech room seem to be differentiated in terms of groupings: those who primarily receive 1-on-1 sessions, those who primarily receive sessions with typically-developing peers, and those who primarily receive sessions with other peers who have an IEP. A final group was differentiated by therapy location, with more than half of sessions occurring in a general education setting.

Collaboration. For each week of the academic year, SLPs indicated whether or not he/she made contact with each child's classroom teacher via email, classroom visit, school visit, phone call, letter, or homework. If the SLP indicated one or more of these forms of contact, that week was coded as "yes" for collaboration. The total number of weeks with teacher contact was divided by the total number of weeks reported to determine a percentage of weeks over the year that the SLP collaborated with the classroom teacher. On average, SLPs collaborated with classroom teachers for 30% of weeks during the academic year (SD=25.87; Range = 0 to 91.89%).

To better understand this feature of therapy, the percentage of weeks the SLPs collaborated with classroom teachers was coded into one of 5 categories: 0%, 1-25%, 26-50%, 51-75%, more than 76%. As SLPs reported collaboration uniquely for each child, the percentage of collaboration between SLPs and classroom teachers was coded for each child. The majority of children in this study had SLPs who collaborated with the teacher for less than 25% of the weeks in the school year (n=116). Strikingly, 14 children had
SLPs who never collaborated with the classroom teacher over the year. Only 23 children had SLPs who collaborated with the teacher for more than 75% of the school year. See Table 6 for complete results.

**Materials.** To characterize the materials used during therapy, materials used in each video-taped therapy session were totaled for each session. Eighteen possible materials were coded for each session; an average of 3.4 materials were used in each session, ranging from 1 to 8, with a median of 3 and a mode of 2. Of the 358 videos, two materials were never used (music and oral motor tools). The materials used least frequently include assessment tools (3 videos; 0.8% of videos), costumes (4 videos; 1.1% of videos), graphic organizers (6 videos; 1.7% of videos), and picture schedules (8 videos; 2.2% of videos). The materials used most frequently include worksheets (160 videos; 44.7% of videos), writing tools (151 videos; 42.2% of videos), and books/literacy materials (135 videos; 37.7% of videos). See Table 7 for descriptive information for each material.

Additionally, I was interested in understanding the number of different materials each child experienced in therapy across two sessions. Each child experienced an average of 3.48 materials per session (*Median* = 3.5, *Mode* = 4, *Range* = 1 to 7). This data might also be considered as a total number of materials each child experienced across two sessions (*M* = 6.93, *Median* = 7, *Mode* = 8, *Range* = 2 to 14).

**Direction.** Each video was coded for six possible modes of direction in a mutually-exclusive and exhaustive framework. Across all videos, Joint: SLP-Led was
coded in 354 out of 358 videos and presented a normal distribution of time across those sessions. The average length of time spent in Joint: SLP-Led direction was 20.98 minutes ($SD = 6.61; Range = 0 to 37.70$ minutes). All other forms of direction demonstrated skewed distributions with a small minority of videos utilizing these forms of direction. For example, "Peer Direction" was only coded in 11 videos and "Child Focused" was only coded in 20 videos. See Table 8 for a complete description of each Direction. The amount of time each child spent in Joint: SLP-Led interactions was calculated as a sum of two therapy sessions ($M = 42.45, SD = 10.86, Range = 11.97 - 66.65$) and an average between two therapy sessions ($M = 21.35, SD = 5.28, Range = 5.98 - 33.33$). The total time children experienced Joint: SLP-Led direction across two therapy sessions was used as the variable of interest for Research Aim 2.

**Targets.** As previously described, two videotaped therapy sessions were captured and coded for each child across the school year. In these 358 videos, SLPs targeted language for an average of 11.65 minutes ($SD = 6.02; Range = 0 to 26.1$) or 48.75% ($SD = 21.45; Range = 0 to 91.5$) of the therapy session. Several details are worthy of noting. First, there were two therapy sessions that did not target language at all during therapy. Additionally, the average therapy session only targeted language for half of the session ($M = 11.97$ minutes) which is striking given that this study was specifically focused on children with LI.

To better understand what each child received during therapy, Targets (or time spent addressing language) was then calculated at the child level (i.e., two videos per
Techniques. Each strategy used during language-based targets were counted for each video. On average, SLPs used 193 techniques during each video (Median = 180; Mode = 92; Range = 0 - 559). All techniques were used across the corpus of videos. Language models, leading questions, and reinforcements were used in the most videos (356, 348, and 341 videos, respectively); think alouds (30) and tactile cues (52) were used in the fewest videos. See Table 10 for a complete description of each technique.

At the child level, techniques were totaled across the two videos. Children received 392 techniques, on average, across two therapy sessions (Median = 377, Mode = 364, Range = 26 - 902.13). Additionally, each technique was collapsed into one of two primary categories: evocative techniques and non-evocative techniques. Evocative techniques are those that prompt a child's immediate response, including leading questions, leading statements, wait time, choices, cloze procedure, phonemic cue, and imitation. Non-evocative techniques, in contrast, do not require a child's response but rather function to model language, provide feedback, or add supports to other evocative strategies, including language models, reinforcement, think alouds, visual cues, tactile cues, and directing attention. Across two videos, children received slightly more non-evocative strategies in total ($M = 212.75$) than evocative strategies ($M = 180.21$). Totals and averages across two videos for each child are presented in Table 11.
**Frequency.** Children received an average of 1.3 sessions per week across the year. However, children received between zero and seven therapy sessions on any given week, indicating much inconsistency. Of the 233 children, only 12 received at least one therapy session each week (i.e., never missed a week of therapy). The other 221 experienced 1 to 19 weeks without any therapy (Median and Mode = 5 weeks). Overall, children received an average of 46.35 therapy sessions total across the academic year (SD = 16.58; Range = 16 to 154). Relatedly, children received an average of 35.46 minutes of therapy each week (SD = 11.96; Range = 12 to 82.65) and a total of 20.95 hours of therapy, on average (SD = 6.86; Range = 7 to 46.83 hours).

**Instructional Quality.** The level of instructional quality was measured through three indicators, including Concept Development, Quality of Feedback, and Language Modeling. Note that a total of 334 of the 358 videos were used to capture instructional support; any therapy videos shorter than 10 minutes in length or that were audio-recorded only (no visual) could not be coded for these dimensions. All aspects of instructional quality fell, on average, within a low to moderate-level of quality (2.84 to 3.70; See Table 12). Recall that quality was captured using a 7-point rating scale with 1 representing low quality and 7 representing high quality. These averages were surprising, given the intended focus of language intervention in therapy settings.

**Emotional Quality.** These 334 videos were also coded for aspects of emotional quality, including Positive Climate, Negative Climate, SLP Sensitivity, and Regard for Student's Perspective (note that Negative Climate was reverse scored). In contrast to
instructional quality, the indicators of emotional quality ranged from moderate to high (4.16 to 6.89) with Regard for Student's Perspective receiving the lowest overall average ($M = 4.19$, $SD = 1.12$, $Range = 1$ to $6$) and Negative Climate receiving the highest overall average ($M = 6.89$, $SD = .33$, $Range = 5$ to $7$). See Table 12 for complete descriptions of each indicator.

**Factor Structure of Features of Speech-Language Therapy.** To further explore the features of speech-language therapy, exploratory factor analysis (EFA) was conducted using IBM SPSS Statistics 19.0 (IBM SPSS Statistics, 2010). EFA allows for identification of shared variance among features of speech-language therapy and provides a way to understand if features of speech therapy related to any overarching constructs. Said differently, I was interested in investigating whether the features of speech-language therapy could be captured by distinct factors. To date, no studies have theoretically or empirically examined the factor structure of speech-language therapy for children with LI; therefore, an exploratory factor analysis was the most appropriate analytic approach for this data.

To conduct the EFA, variables representing each feature of speech-language therapy were added to a model. For service delivery models, Typical Peers, IEP, 1-on-1, Small Group, Large Group, XLarge Group, Speech Room, Classroom, and Collaboration were included. For Materials, the total number of different materials used across two therapy sessions was included. For Direction, the total time spent in Joint: SLP-Led interactions across two therapy sessions was included. For Target, the total time spent
addressing language was across two therapy sessions was included. For Techniques, Evocative and Non-evocative techniques across two therapy sessions was included. For Frequency, Sessions and Time in Therapy was included. Finally, for Instructional and Emotional Quality, each of the quality indicators were included.

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.744 and Bartlett’s Test of Sphericity was significant ($\chi^2 = 2133.85, df = 136, p < .001$) indicating correlations were present among the variables (i.e., which is necessary to conduct the EFA. The scree plot indicated a steep drop in potential factors at five; therefore, five factors were indicated using Principal Axis Factoring. In order to maximize loadings onto each factor, an oblique rotation using Promax was applied to the data. The correlation matrix revealed several correlations between factors (Factor 1 and Factor 2: $r = .475$; Factor 2 and 3: $r = .289$; Factor 3 and 5: $r = .246$; Factor 4 and 5: $r = .219$) which justifies use of oblique rotation. However, to consider all possibilities, orthogonal rotations were also used and demonstrated similar factor structures. Theoretically, the factors were expected to correlate as they all describe aspects of therapy, so oblique rotations were chosen for the remainder of the analyses.

Five factors were identified from the Pattern Matrix. In this section, I identify the features of speech-language therapy that loaded onto each factor and assign a name to the factor based on theoretical assumptions of the relation among features. The first factor, Internal Structure, included Target, Evocative Strategies, Non-evocative Strategies, and Joint: SLP-Led. This factor captured features within the therapy session specific to
targets, techniques, and direction. The second factor, Instructional Quality, included Language Modeling, Concept Development, Quality Feedback, and Regard for Student's Perspective. The third factor, Emotional Quality, included Positive Climate, Negative Climate (Reverse Scored), and SLP Support. These factors grouped similarly to the composites of Instructional and Emotional Quality from the CLASS. In the current analysis, Regard for Student Perspective loaded with Instructional Quality rather than Emotional Quality, as is the case in the CLASS measure. The fourth factor, External Structure, included Time in Therapy, Total Sessions, Speech Room and Small Group. This factor captured aspects of service delivery (Speech Room and Small Group) and frequency (Time in Therapy and Total Sessions) that address when, where, and how often therapy is provided. And the fifth factor, Inclusion, included Classroom, Typical Peers, and Contact. The Inclusion factor represents aspects of service delivery models that allow for inclusion of children with LI with typically developing peers as an aspect of speech-language therapy.

Factor loadings for each factor are depicted in Figure 2. These factor loadings function as "weights" and were used to derive factor scores for each of the five factors for each child. Factor scores were extracted using Regression Method in SPSS and saved for use in analyses specific to research question two. Additionally, some variables didn't load on any factors including IEP (therapy sessions that included other peers who also had an IEP), Materials (total number of different materials used in therapy), 1-on-1, Large Group
Correlations were then run between each factor and gain; significant correlations were noted between Internal Structure and Instructional Quality \((r = .502, p < .01)\), Instructional Quality and Emotional Quality \((r = .304, p < .01)\) and Emotional Quality and Inclusion \((r = .222, p < .01)\). These correlations suggest moderate relations between aspects of quality and Internal Structure (what happens within a therapy session) and with Inclusion (the extent to which children experience therapy in an inclusive environment). No significant correlations were noted between Language Gain and any of the factors (See Table 13).

**Research Aim 2: To Determine the Extent to Which Features of Speech-Language Therapy Independently and Interactively Predict Children's Language Gain over an academic year.**

The second research aim sought to identify which features of speech-language therapy predict children's language gains from fall to the spring of an academic year. To answer this question, all analyses were conducted using multiple regression in IBM SPSS Statistics 19.0 (IBM SPSS Statistics, 2010). To determine the effect size for average gain in this sample, raw scores were transformed to z-scores across all subtests and averaged to determine an average z-score for fall \((M = 0, SD = .826)\), and spring \((M = .533, SD = .896)\) using fall means and standard deviations. An effect size for gain was calculated by subtracting the average z-score in the fall from the average z-score in the spring and
dividing by the pooled standard deviation. Children in the current sample demonstrated positive change from fall to spring, on the magnitude of .62 standard deviations.

To identify which features of speech-language therapy predict language gain, models were run in two phases. The first phase evaluated the predictive nature of the factors identified in the EFA on children's language gain. For this phase, each of the five factor scores from the EFA (Internal Structure, Instructional Quality, Emotional Quality, External Structure, and Inclusion) were entered into a single multiple regression model to assess the relation among all five factors and Language Gain; no concerns of multicollinearity were indicted. This model was not significant $[F(5,220)=.523, p = .759]$; See Table 14].

The second phase evaluated the association between individual features of speech-language therapy and children's language gain. For this phase, features that were significantly correlated with Language Gain were entered into a single multiple regression model; these included Large Group, Typical Peers, Evocative Strategies, and Regard for Student's Perspective. Although there was a weak correlation between two of the predictor variable (Large Group and Typical Peers), all other tests of collinearity suggested no concern with multicollinearity.

The model including four predictors of Language Gain was significant $[F(4,221)=4.176, p = .003]$. The $R^2$ for this model was .07, suggesting that 7% of the variance in Language Gain is explained by this model that includes Large Group and Typical Peers as predictors. See Table 15 for model results. According to this model,
Large Group and Typical Peers were significant predictors of Language Gain. For every standard deviation increase in Large Group, Language Gain decreased by .147 standard deviation units, controlling for all other predictors. This suggests that children who experience large group therapy sessions demonstrate less gain across the academic year than children who do not experience therapy in large group sessions. Additionally, for every standard deviation increase in Typical Peers, Language Gain increased by .148 standard deviation units, controlling for all other predictors. This suggests that including typical peers in therapy sessions has a positive association with children's language gain over the academic year. Evocative Strategies and Regard for Student Perspectives were not significant predictors.

The final phase investigated any interactions among features of speech-language therapy that might explain variation in Language Gain. For this step, interaction terms were created between each factor (Internal Structure, Instructional Quality, Emotional Quality, External Structure, and Inclusion) for a total of 10 interaction terms. Each interaction term was added into a separate model with the two corresponding factors entered as predictors and Language Gain as the outcome variable. None of these models were significant at the .05 level.

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1 Analyses were also run in HLM; Large Group and Typical Peers were still significant predictors of Language Gain.
Chapter 5: Discussion

Children with LI are at substantial risk for immediate and long term deficits in social and academic outcomes, and provision of speech-language therapy may help to mitigate the negative impacts of LI. However, few empirical studies exist to guide SLPs in the provision of effective, evidence-based speech-language therapy (see Cirrin & Gillam, 2008). Intervention research has identified certain features of language therapy that may be associated with language outcomes (e.g., service delivery models, techniques, frequency), but limited external validity restricts the extent to which these studies can inform school-based therapy. As such, very little is understood about children's experiences in speech-language therapy nor the active ingredients associated with change over time. The present analyzed 10,819 therapy sessions and 358 video-taped sessions for 233 children to address these aims. These sessions were investigated in a business-as-usual format which allowed for description and discussion of features of speech-language therapy as they naturally occur in the public schools, understanding of the current state of therapy for children with LI, and identification of active ingredients relevant to children's language gain. This is the first, large-scale investigation into business-as-usual therapy sessions in the public schools, and as such, the results inform theory, practice, and research specific to this population. Key findings from this study will be discussed in terms these three facets.
Theory

This current study was guided by two theoretical principles: (a) speech-language therapy is beneficial to language learning for children with LI, and (b) speech-language therapy is individualized to addresses children's specific needs. In the following paragraphs, I discuss each of these principles in light of the study findings and propose how the data might inform theory.

The first theoretical principle guiding this study is the notion that speech-language therapy is beneficial from a public service perspective as well as in terms of clinical significance. From the public service perspective, speech-language therapy may serve as a support system for children with LI. SLPs are trained to understand the communication patterns of children with LI and as such, children with LI receiving therapy may have the opportunity to experience "being understood" that may not be afforded in general education classrooms. This act of being understood may be important for children with LI who, as a population, tend to experience negative social impacts in the classroom secondary to their LI (e.g., Becker et al., 2001; Fujiki et al., 1996; Knox & Conti-Ramsden, 2003).

Although measuring the level of comfort and support children experience in therapy was not a direct aim of the current study, the level of emotional quality may be such an indicator. Emotional quality was measured across four domains including Positive Climate, Negative Climate, SLP Sensitivity and Regard for Student Perspective. The scores for emotional quality across all participants' therapy sessions ranged from...
average to high. This finding is significant in that it suggests that regardless of the actual intervention or structural components of therapy, children experience an emotional climate conducive to feelings of warmth, care, and concern. Studies from the educational literature suggest that children nested in environments with high emotional quality are more willing to take risks, participate in activities, and show stronger gains on social aspects of development than peers in low emotional quality environments. From a theoretical perspective, this finding suggests that therapy sessions may provide such support to children with LI.

Not only is speech-language therapy expected to serve as a support system for children with LI, but it is also expected to be beneficial to children with LI in terms of their language growth. Theoretically, speech-language therapy is clinically significant for children with LI; children with LI who receive speech-language therapy are understood to improve their language abilities, important for both social and academic outcomes. Given this theoretical principle, and the fact that this study involved 233 children who received at least a year of therapy, I expected all children to make gains in their language abilities from fall to spring. Indeed, on average, this population of children did improve on the magnitude of .62 standard deviations. This effect size is generally comparable to those of other language intervention studies (see Gillam, Gillam, & Reece, 2012; Gillam et al., 2008; Law et al., 2004); although, direct comparison should be tempered as these studies all utilized one-on-one therapy and SLPs delivered researcher-determined intervention plans.
However, overall gain for the current population of children with LI reveals much variability: some children gained up to 3 SD more than the average child with LI while other children gained 3 SD less than the average child with LI. Recall that gain was computed as the difference between fall and spring factor scores, with a mean of 0 (those making average gain) and a standard deviation of .12. While there was no comparison group to understand how much of this gain is attributable to development and/or exposure to general education classrooms, it does suggest that therapy for children with LI is not uniformly effective. The participants of the current study shared two commonalities, primarily: all had a diagnosis of LI and all received language therapy for an entire school year. Yet, the amount of language change between fall and spring differed. This suggests that provision of therapy in and of itself may not be sufficient for impacting change (see Gierut, 2005; Lambert & Barley, 2002). Differential outcomes underscore the importance of identifying active ingredients of therapy that are associated with change, and more specifically, associated with above average change in language.

Considerations for above average change may be key for children with LI. Per the diagnosis of LI, children with LI function well below their typically-developing peers in communication which impacts academic proficiency and long-term success with employment and higher education (see Johnson et al., 2010). Longitudinal studies of children with LI indicate there to be much stability in the disorder: children with LI continue to manifest symptoms of LI even with intervention (Conti-Ramsden et al., 2001). This phenomenon has been well documented in the literature specific to literacy.
hildren who enter kindergarten with weak literacy skills tend to fall further and further behind typical peers throughout elementary school (Chaterji, 2006; Chernoff, Flanagan, McPhee, & Park, 2007; Hill, Bloom, Black, & Lipsey, 2008). If children with LI are going to achieve expected academic milestones, then they need to make substantial gains in therapy. Said differently, if children with LI fall 1.5 SD or more behind their typically-developing peers (as identified from diagnostic, norm-referenced measures), then speech-language therapy must support language growth beyond that which would be expected from continued development and exposure to instruction in a general education classroom. Consequently, children with LI who make minimal progress over an academic year may be at significant risk for experiencing continued negative impacts in academic success secondary to persisting LI. In this regard, the theoretical principle that speech-language therapy is beneficial is generally true in that children with LI did make gains over the academic year. However, the degree of benefit varies dramatically. Results of this study suggest that speech-language therapy may have differential effects on children's outcomes, and understanding factors associated with greater gains may be of critical importance in eradicating the negative effects of LI.

The second theory guiding this study is that therapy addresses the individual needs of children with LI. SLPs face legal and professional responsibility to create therapy plans unique for every child (ASHA, 2000; IDEA, 2004). As has been discussed, children with LI are a heterogeneous population, presenting with a range of language profiles and severity levels (Conti-Ramsden et al., 1997). These mandates suggest that
effective therapy must address the individual profile of each child to be effective. Given the heterogeneous population of participants in the current study and the expectation that all therapy be unique for each child, I expected much variability across the features of therapy explored in this study. However, findings from the current study suggest this is not always the case. Indeed, some features presented with much variability, including materials, frequency, targets, techniques, and instructional quality. However, other features demonstrated very little variability across study participants. Specifically, restricted variability was observed across service delivery models and direction.

Much heterogeneity was exhibited across the majority of features of speech-language therapy. In many instances, this was not unanticipated. The intervention literature in speech-language pathology highlights a wide array of effective components of any given feature, with studies manipulating discrete components to assess the relation with language outcomes. For instance, Yoder and Stone (2006) investigated the difference in two techniques (picture cards vs language modeling) for children with autism, whereas Bradshaw et al. (1998) contrasted cloze procedures with language modeling. Although no study to date has documented exactly what features of therapy SLPs use during therapy, existing research suggests that features of therapy may be used differentially to account for children's needs. As an example, SLPs in the current study utilized a variety of materials, including worksheets, books, pictures/flashcards, and graphic organizers (less frequently) which according to the literature, may be reflective of the heterogeneous nature of the participating children. Ukrainetz (1998) found that using
graphic organizers was effective for children with language learning disorders, whereas Carr and Felce (2007) found picture cards to be effective for children with autism. Additional intervention studies vary in their selection of materials to implement therapy, including toys and manipulatives for younger children (Girolametto et al., 2004) or books to address aspects of narrative development (Gillam et al., 2012). Although linking features of therapy to children's needs was not a specific aim of the current study, participants presented with much diversity in terms of language need as well as severity and presence of comorbid diagnoses. As such, the variability within features of speech-language therapy identified in the current study may reflect that heterogeneity.

In contrast, the majority of children with LI experienced one primary service delivery model and one primary form of direction (i.e., Joint: SLP-led). Certainly a variety of models and direction were represented in the current study; however, the vast majority of children with LI received small group sessions in a speech room with other children with an IEP (i.e., a traditional model). This finding converges with two other studies of speech-language therapy practices by Brandel and Loeb (2011) and Mullen and Schooling (2010); these studies indicated that approximately 75% of children in the public schools receive pull-out therapy in small group sessions. The fact that the majority of sessions occurred in a speech room and in small group configurations suggests that factors other than child-level needs may be driving service delivery models (see Brandel & Loeb, 2011).
The homogeneity of service delivery models and therapy direction not only stands in contrast to ASHA mandates (2000) and IDEA (2004) stating no one service delivery model should be used for all children but also to the few empirical studies that found positive associations between alternative service delivery models, forms of direction, and children's outcomes (see McGinty & Justice, 2006 for a review). For example, Throneburg et al. (2000) indicated that children receiving collaborative, classroom-based therapy made more gains over time than children in pull-out settings. Additionally, Giralometto et al. (2000) and Connor et al. (2006) found that children in interactions that utilized a child-led approach made more gains in language than children in classrooms utilizing a teacher-led approach. Given existing empirical evidence as well as professional responsibility to address each child's needs uniquely, it is surprising to find such homogeneity. I offer two possible explanations for these results. For one, these findings may represent a prevailing gap between research and practice. Studies that address features of language therapy can only have an impact on practice if SLPs receive and apply the information. This finding may have both theoretical and practical implications addressing the extent to which SLPs gather current empirical evidence and utilize such information to inform their therapy sessions. Additionally, studies from Mullen & Schooling (2010) and Brandel and Loeb (2011) were published after the onset of the current study. One explanation for the homogeneity may simply be that SLPs had not been informed of study findings nor had sufficient time to change service delivery methods before the current study began.
Second, the homogeneity in service delivery models may reflect constraints of the public school environment. Several research studies and commentaries have been published investigating SLP and classroom teacher's perspectives on integrated service delivery models (i.e., therapy provided in the classroom; Achilles, Yates, & Freese, 1991; Beck & Dennis, 1997; Ehren, 2000; Elksnin & Capilouto, 1994; Kavale, 2002; Law et al., 2002; Russell & Kaderavek, 1993). A study by Ehren (2000) identified several concerns from SLPs that inhibited classroom service delivery, including lack of training in conducting classroom intervention, an overall lack of intensity focused on specific language needs, and ambiguous roles for SLPs and teachers. Other studies identified specific barriers including difficulty addressing IEP goals (Achilles, 1991; Beck & Dennis, 1997; Elksnin & Capilouto, 1994) and difficulty collecting data specific to each child's language progress (Beck & Dennis). However, the most cited barrier to implementing classroom-based services was time and access (Beck & Dennis, 1997; Elksnin & Capilouto, 1994; Ehren, 2000). Effective classroom-based therapy requires teachers to be willing to collaborate with the SLP and share instructional time, as well as engaging in planning with the SLP prior to therapy sessions. With increasing caseloads and limited time, SLPs suggest that finding time to collaborate effectively is increasingly prohibitive (Beck & Dennis, 1997; Elksnin & Capilouto, 1994; Ehren, 2000). The lack of variability found in the current study may reflect these barriers to implementing classroom-based therapy, regardless of empirical evidence suggesting its positive effect on children's outcomes and mandates to determine service delivery models based on
children's individual needs (ASHA, 2000). Although the current study did not investigate predictors of each feature of speech-language therapy (i.e., do individual needs predict certain features), the degree of variability of study features may be considered a proxy to SLPs' individualizing therapy for children with LI.

**Practice**

The investigation of business-as-usual speech-language therapy has immediate implications for SLPs working in the public schools. SLPs face growing accountability in the educational, professional, and legal arenas to ensure children with LI receive individualized intervention, guided by their individual needs, and attain educational standards (ASHA, 2000; IDEA, 2004). Evidence from the current study may be one way to support SLP's use of evidence based research to bolster language outcomes for children with LI. This study sought not only to describe business-as-usual therapy sessions, but to identify active ingredients of language therapy (i.e., measurable aspects of speech-language therapy that explain variance in children's language). Two active ingredients were identified from this study: group size and group composition. Children who experienced therapy sessions with a large group of peers (i.e., 5-7) gained less on average than peers who were seen in smaller groups. Additionally, children seen in groups that included typically-developing peers gained more on average than peers in sessions with only other children with an IEP. In the following paragraphs, I discuss each of these findings and offer practical suggestions of how these active ingredients might inform clinical practice for SLPs serving children with LI in the public schools.
**Group Size and Language Gain.** The negative association between large group sessions and children's language gain is intuitive. A hallmark study out of Tennessee showed significant academic advantages to children placed in low student:teacher ratio classrooms (Mosteller, 1995; Nye, Hedges, & Konstantopoulos, 1999; 2000). This study investigated math and reading outcomes for 6,500 early elementary children placed in either small enrollment classrooms (less than 17 peers) or larger enrollment classrooms (more than 22 peers). Children in small enrollment classrooms performed better than peers in large enrollment classrooms across standardized measures of math and reading, with effect sizes of .13 to .27 (Mosteller, 1995). The positive association between small class size and outcomes seemed to strengthen the more years children experienced instruction in small enrollment classrooms (Nye et al., 2000). Additionally, this effect persisted beyond early elementary years (Nye, Hedges, Konstantopoulos, 1999) suggesting that the group size matters to children's overall achievement.

In a similar pattern, large group therapy sessions may be less poised to influence change in children's language systems than smaller group sessions. The reason for this association is less clear. Although this study was not causal in nature, I offer two possible explanations for this finding. First, children in large group sessions may receive fewer therapeutic doses understood to be important for language gain (Fey, 1997; McGinty et al., 2011; Ukrainetz, 2009). Consider a scenario: If there are five children in a 20-minute therapy session, the total number of doses (or teaching episodes) would be divided among each child. In this case, each child would receive on average 4 minutes of concentrated
therapy (or 4 minutes of teaching episodes). In contrast, if there are only two children in this same therapy session, the total number of teaching episodes would be divided by two children, resulting in 10 minutes of concentrated therapy for each child. In this regard, children in large group sessions may receive less therapy and fewer teaching episodes than children in sessions with fewer peers.

Second, children in large group therapy sessions may not receive therapy targeted at their specific areas of need. Given the heterogeneity of the current sample, it is likely that children in a large group session present with a wide range of language symptoms. For example, in a large group of five children, two children may exhibit deficits only in grammar, one child only in vocabulary, and two children in vocabulary, pragmatics, and literacy. Within a 20-minute session, an SLP would have to prioritize areas of language to target. If the SLP chose to address language needs for the majority of children in the group, such as, vocabulary, this therapy time may not be sufficient to influence gain for the child struggling with grammar. Vice-versa, if the SLP chose to address grammar, this time may be irrelevant for the children struggling with vocabulary, pragmatics, and literacy. Said differently, within large group settings, each child's specific language needs may be met too infrequently to impact real change.

Tyler and Sandoval (1994) found this to be the case. Children in their study made progress in the area of language targeted without evidence of carryover to non-targeted areas of language. Moreover, intervention research by Leonard et al. (2008) showed that not only does the area of language matter, but the discrete area of concern. In their study,
all children with grammatical delays received intervention; however, only the specific morphological structures targeted during therapy showed changes over time. No cross-over effects were noted. These studies suggest that therapy must map directly onto a child's area of need to be effective, and large group sessions may pose significant challenges for SLPs attempting to meet each child's need. As such, children in large group sessions may not be receiving therapy focused specifically on their language weaknesses, shown to be important for overall language growth (Leonard et al., 2008; Proctor-Williams & Fey, 2001; Tyler & Sandoval, 1994; van Kleeck, Woude, Hammett, 2006).

**Group-Size Recommendations for SLPs.** Given the negative association between large group size and children's language gain, SLPs should consider minimizing the size of their groups in pull-out models. Specifically, as group size exceeds four children in a group, children are at risk for reduced language gain over the academic year. This recommendation may have policy implications, as large group sizes may be a result of increased caseloads, logistical constraints, and workload. SLPs only have a certain number of hours in a day to provide therapy for the children on their caseload. On average, SLPs working full-time in the schools have 50 children with speech and language disorders on their caseload for whom they are responsible to plan and implement treatment (ASHA, 2010a). As this number increases, SLPs have more children to see in the same amount of time. Advocating for capped caseload size may be an important advocacy role of SLPs, administrators, and ASHA policy leaders to ensure not
only that SLPs have a manageable caseload, but that they are able to provide services following best practices.

Beyond caseload size, SLPs are also constrained on times during the day that they are able to provide therapy for children. Each district has specific rules about when children can be removed from a general education classroom (e.g., not during language arts or math) and what extra-curricular activities children can miss (e.g., not physical education), leaving even fewer options for scheduling speech-language therapy. SLPs might consider alternatives, such as pragmatic groups during lunch or recess or literacy groups during library time, to reduce group size within the constraints of school schedules.

**Typically-Developing Peers and Language Gain.** The positive association between therapy sessions that include typically-developing peers and language gain converges with prior research on peer-effects in classroom settings. A growing number of studies in the educational literature link peer effects to children's outcomes, over and above the influence of particular curriculum or instructional foci (Goldstein, English, Shafer, & Kaczmarek, 1997; Harper, Mallette, & Moore, 1991; Kohler & Greenwood, 1990; McGregor, 2000). A study by Justice et al. (2011) found that children with low average language, nested in classrooms where the average language level of peers was average to above average gained significantly more over an academic year than children in classrooms with peers who also had low average language abilities. This study's finding suggests that a similar association may hold for speech-language therapy sessions.
as well. What is less understood is why inclusion of typically-developing peers is associated with children's gains. Two explanations are described below.

First, it may be that inclusion of typically-developing peers in therapeutic contexts has a direct effect on language gain by providing children with LI with rich language models understood to be important for language development (see Girolametto & Weitzman, 2006). A study by McGregor (2009) found that children with weak language, paired with higher-performing peers, gained more over the intervention period than control groups. Findings from that study suggest that peer models during a structured task had direct influence on children's language growth. In a similar way, children with LI who receive therapy with typically-developing peers may be gaining more in language as a direct result of peer modeling.

Second, inclusion of typically-developing peers may have an indirect effect on language gain. The presence of typically-developing peers in the group may drive the level of instruction or intervention of the therapy session. The arguably higher-level language of the typically-developing peers may raise the complexity of the teacher - or SLP - talk during therapy, which might then influence gain. Evidence in educational literature suggests that the complexity of adult talk is associated with children's language gain. In a study of 34 preschoolers, Huttenlocher, Vasilyeva, Cymerman, and Levine (2002) found that children who were exposed to more complex syntactic speech from their classroom teacher exhibited greater growth in syntax over an academic year than peers in less complex environments. In this manner, the inclusion of typically-developing
peers in therapy sessions may have an indirect effect on language gain by raising the complexity of adult talk, understood to be important to children's language development.

**Group-Composition Recommendations for SLPs.** As indicated from study findings, children who receive speech-language therapy with one or more typically-developing peers gain more on average than those receiving therapy with other children with an IEP. Although the mechanism through which this association occurs is unknown, inclusion of typically-developing peers is a feasible change SLPs can make to their therapy sessions, has the potential to positively influence gain, and is supported in the educational literature as being influential to children's outcomes (Justice et al., 2011; McGregor, 2009). This change could occur in several ways. For one, SLPs might include typically-developing peers into their more traditional pull-out therapy sessions. Peers could function as language models as well as communication partners for children with LI. Additionally, SLPs might consider collaborative therapy models with the classroom teacher. Collaborative therapy sessions by nature include typically-developing peers and may also support carry-over of language skills to more natural, academically-relevant situations. Finally, inclusion of typically-developing peers may act as a protective measure in large group sessions. The negative association between large group therapy sessions and children's language gain may be reduced when typically-developing peers are included. In this way, SLPs who feel restricted by group size and logistical constraints of their service provision may be able to minimize the negative impact of large group scenarios.
To support SLP's efforts in inclusion of typically-developing peers, professional development seminars as well as master-level training programs need to focus on how SLPs might effectively incorporate typically-developing peers into speech-language therapy sessions. As previously discussed, it is unclear what the mechanism of change is for sessions that include typically-developing peers. Until that is better understood, SLPs are encouraged to incorporate information from educational research studies with their knowledge of children's language needs to explore alternative approaches to therapy. For instance, in the McGregor study (2009), children with weaker language were paired with children with stronger language to complete language tasks (i.e., narrative generation). In a similar way, SLPs might pair children with LI with typically-developing peers to complete language tasks, rather than the SLP or another child with LI serving as the communication partner during therapy.

**Research**

Beyond theory and practice, the present study offers several future directions for researchers vested in understanding speech-language therapy in the public schools, identifying active ingredients influential to children's language growth, and discovering interventions effective in eradicating LI for children in the public schools. The most striking finding from this study was the limited number of active ingredients identified specific to children's language gain. Identifying features of language therapy that do bring about changes in children's language is a critical goal for researchers and a necessary first step in promoting effective therapy strategies in school-based, speech-language therapy
sessions. In the following paragraphs, I explore six high-priority goals for clinically-based research in the public schools.

First and foremost, further research is needed to identify the active ingredients of speech-language therapy. The process of identifying active ingredients of speech-language therapy seems to be quite elusive. Very few features were related to language gain in the current study, despite evidence in the literature suggesting their significance. One explanation for the lack of significant findings may be methodological differences between the current study and existing literature related to features of therapy. In many of the studies that informed the current investigation, the actual treatment process was kept constant: children had similar language needs as determined by the researcher and therapy was administered by trained research staff (Leonard et al., 2006, 2008; Proctor-Williams & Fey, 2001; Tyler et al., 2003; van Kleeck, Gillam, & McFadden, 1998). These procedures ensured that the treatment itself was constant across participants and allowed the therapy feature of interest to be manipulated.

In the current study, each SLP was asked to conduct therapy in a business-as-usual format, which may have resulted in much variation in therapy processes. All features explored in this study, with the exception of instructional and emotional quality, address structural aspects of therapy (i.e., the when, where, and what of therapy) and did not investigate the appropriateness or effectiveness of the therapy itself (i.e., the how of therapy). Analysis of the structural features in this study assumed that all therapy was conducted equitably in terms of appropriateness for each child and effectiveness for
influencing change. If, rather, therapy sessions varied in their overall effectiveness, then considerations of structural features of therapy alone may not be sufficient to explaining children's language gain over time. Further research is needed to understand the role of therapy processes with public school speech-language therapy sessions and how these processes relate to children's gain. Specifically, researchers should consider whether or not children are receiving appropriate therapy (i.e., therapy that maps onto their needs) and whether that therapy is being conducted in an effective manner.

Second, researchers should investigate optimal methodologies to capture gain - or changes in children's language over time. This study calculated a gain score as the outcome variable of interest, using five indicators of language measured in the fall and spring of the academic year. This was an appropriate statistical approach, given the interest in explaining children's language change from fall to spring of an academic year. However, there are many ways to statistically consider children's language change over time. Other methods, such as residualized gain and predicting spring scores while controlling for fall may add to our understanding of effects of therapy on children's language. Additionally, person-centered approaches, such as identifying groups of children by amount of gain (i.e., lowest quartile versus highest quartile), might reveal patterns or associations among features of therapy that were masked when considering gain continuously.

Third, randomized control trials are warranted to explore the relation between the two active ingredients of speech-language therapy identified in the current study (i.e.,
group size and group composition) and children's language gain. The current findings were correlational in nature and do not speak to directionality of influence between constructs. Additionally, the gain scores should be interpreted with caution as they indicate the amount of change relative to the current sample of children with LI. Future studies are needed to understand how changes in group size and group composition are associated with other samples of children with LI. Furthermore, randomized control trials (RCTs) conducted within school-based settings are needed to understand the direction of effects and the potential for group size and group composition to directly influence children's language gain.

Fourth, future studies are needed to investigate child-level and SLP-level factors that may contribute to children's language gain over an academic year. As previously indicated, some features of language therapy presented with much homogeneity across a diverse group of children with LI. This suggests that factors other than children's needs may be driving therapy planning. SLP-level factors should be investigated to understand their contribution to children's therapy experiences. Additionally, child-level factors such as fall language status and behavior regulation may influence the relation between certain features of therapy and language outcomes. Further research is needed to understand the role child-level and SLP-level factors have both on features of therapy as well as on language outcomes for children with LI.

Fifth, confirmatory factor analysis should be conducted to validate the factors of therapy identified in the current study. The factor analysis as reported in results was
highly exploratory given no precedence in the speech-language pathology literature for how features of language therapy might relate to each other. The EFA suggested that the observed indicators of speech language therapy in this study share common variance and might be conceptualized in five distinct latent variables, including Internal Structure, External Structure, Instructional Quality, Emotional Quality, and Inclusion. Confirming - or identifying alternative factor structures - of speech-language therapy may support understanding of how features of speech-language therapy relate to children's experiences in public school settings.

Similar processes have been conducted in educational sciences, identifying factors that capture underlying constructs relevant to a particular environment. Mashburn and colleagues (2008) identified both structural and quality constructs that guided understanding of important aspects of the classroom. These constructs, or factors, were used not only to better understand active components of the classroom (theory) but also to guide research specific to those components. In a similar way, identifying factors, or constructs, specific to speech-language therapy may inform our conceptual understanding of this environment for children with LI and guide future research endeavors. Just as effective classrooms might best be considered from the underlying factors (a combination of structural and quality factors), speech-language therapy might be better understood by its component factors (external structure, internal structure, instructional quality, emotional quality, and inclusion).
Finally, additional intervention studies are needed within public school settings. Tightly-controlled, researcher-administered studies provide a base understanding of potentially active ingredients that may be relevant to clinical populations in the public schools. These studies provide a rich foundation that informs our understanding of LI as well as the role of intervention on language gain. However, to fully understand speech-language pathology services and the impact of those services on children's outcomes, the research community must be willing to address questions of evidence-based practice within the public schools. Educational research has provided a framework for such studies, implementing teacher-administered interventions in existing classrooms with a range of children in terms of ability and socio-economic background to assess effects on children's outcomes (e.g., Connor et al., 2006; McGinty et al., 2011; McGinty et al., 2012; Piasta et al., 2012; Zucker, Cabell, Justice, Pentimont, & Kaderavek, 2012). In so doing, these studies not only contribute to what we understand about educational intervention effects, such as reading interventions, but also promote generalization across teachers, children, and classrooms. In a similar way, speech-language pathology researchers are urged to investigate interventions with clinical populations as seen in the public schools to advance identification and implementation of effective interventions for children with LI.

Limitations

This study took an initial look into business-as-usual speech-language therapy practices for children with LI. Although study methodologies were appropriate to answer
both study aims, there are limitations of the design that warrant discussion and consideration.

First, this study was correlational in design and as such, no causal conclusions can be drawn between significant features of therapy and children's language gains. Explanations of study findings should be tempered, understanding that it was not the intent of the current study to explore mechanisms within significant findings. Further studies are needed to understand how significant features of therapy relate to language gain and whether or not systematic manipulation of these features results in increased language gain for children with LI.

Second, two videos were selected for coding and analysis for the current study. Although selected videos were representative of the larger corpus of therapy session (specific to group size) and SLPs were asked to capture typical sessions on tape, coding of additional videos might offer a more comprehensive understanding of the internal structure of speech-language therapy sessions.

Third, this study focused on features of speech-language therapy informed from prior research as associated with children's language gain. That research originated from both educational sciences as well as discrete intervention studies within speech-language therapy and as such, exhibited strong rationale for inclusion in this study. However, this study did not investigate features of language therapy specific to the intervention itself, such as whether or not language targets aligned with children's language goals, the extent to which techniques were effectively used to scaffold improved language, or the
complexity at which speech-language therapy was delivered. In short, this study looked at
the conditions of speech-language therapy for each child rather than the interactive
influences between the SLP and child. It may be that to fully understand the role of these
features of speech-language therapy on language gain, we must first understand how the
appropriateness and effectiveness of language therapy relates to children's language gain.
Nonetheless, the current study was a necessary first step in understanding business-as-
usual therapy practices for children with LI in the public schools.

Conclusion

Investigating speech-language therapy practices in the public schools for children
with LI is a critical focus for SLPs and researchers. Children with LI comprise a large
proportion of children served by SLPs (ASHA, 2012) and are at known risks for negative
academic outcomes into adulthood (Conti-Ramsden et al., 1999; Johnson et al., 2010).
While much is understood about children with LI and the manifestation of the disorder,
far less is understood about active ingredients of therapy that support children's language
growth. The current study is the first comprehensive investigation of business-as-usual
therapy practices in the public schools for children with LI and contributes to the
theoretical, practical, and future research endeavors for the field of speech-language
pathology.

Study findings suggest that children with LI do experience benefit from speech-
language therapy; however, the amount of gain varies dramatically suggesting that
therapy has differential effects. Much variability exists for many features of therapy, but
the majority of children experience a traditional service delivery model of speech-language therapy in a speech room with a small group of peers who also have IEPs. This is particularly striking given the significant findings for this feature of therapy. Children who experienced therapy in large group sessions made less gain and children who received therapy with typically-developing peers showed greater gains over an academic year. Nonetheless, the hallmark finding from this study was the overall lack of active ingredients identified from these features of language therapy. Existing literature suggests that discrete features of language therapy contribute meaningfully to children's language outcomes; however, study findings suggest that other unidentified factors may function as active ingredients of language therapy for children with LI. This study contributes significantly to our theoretical and practical understanding of the inner workings of speech-language therapy sessions for children with LI in a business-as-usual framework. It is my hope that this study will serve as a impetus for further research within the public schools aimed at systematically identifying active ingredients of speech-language therapy and incorporating effective interventions into the schools to support language growth for children with LI.
References


Individuals with Disabilities Education Act of 1997, P.L. 105-17


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developmental impairment have vocabulary deficits characterized by limited
breadth and depth. *International Journal of Language and Communication Disorders*.


Hearing Services in Schools, 20*, 149–152.


pediatric speech-language pathology. *Language, Speech, and Hearing Services in
Schools, 41*, 44-60.


National Institute for Child Health and Human Development Early Child Care Research
Network. (1999). Child outcomes when child care center classes meet
1072-1077.

National Institute for Child Health and Human Development Early Child Care Research
effects of child-care quality on young children's development. *Psychological
science, 13*(3), 199-206.


Nye, B., Hedges, L., Konstantopoulos, S. (2000). The effects of small classes on
academic achievement: The results of the Tennessee class size experiment.

the language/learning disabled. *Journal of Speech and Hearing Disorders, 52*,
348-357.

the development of sentence comprehension. *Topics in Language Disorders,
10*(3), 63-75.

Mosby-Year Book, Inc.


Appendix A

Tables and Figures
Table 1

**LIOS Codes by Behavior Group**

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<th>Talk Time</th>
<th>Materials</th>
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<td>Writing Tools</td>
<td>Grammar</td>
<td>Language Modeling</td>
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<td>Worksheets</td>
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<td>Articulation/Phonology</td>
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Table 2

Study Variables Described by Construct, Source of Data, and Variable Form

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Table 3

Correlations among Features of Speech-Language Therapy and Language Gain

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<td>.027</td>
<td>.139*</td>
<td>.119</td>
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<td>.008</td>
<td>.247**</td>
<td>.072</td>
<td>.222**</td>
<td>.068</td>
</tr>
<tr>
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<td>.019</td>
<td>-.064</td>
<td>.034</td>
<td>.040</td>
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<td>.028</td>
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<td>.128</td>
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<td>.323**</td>
<td>.142*</td>
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<td>.067</td>
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<td>15. NonEvocative</td>
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<td>.199**</td>
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<td>.353**</td>
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<td>18. Negative Climate</td>
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<td>.269**</td>
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<td>19. SLP Sensitivity</td>
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<tr>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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Continued
Table 3, Continued

<table>
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<th></th>
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<th>23.</th>
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<td>-.055</td>
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<td>-.016</td>
<td>-.007</td>
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<td>3. Peers with IEPs</td>
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<td>.153*</td>
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<td>5. Small Group</td>
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<td>-.166*</td>
<td>-.131*</td>
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<td>6. Large Group</td>
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<td>.020</td>
<td>.007</td>
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<td>7. Speech Room</td>
<td>-.182*</td>
<td>-.175**</td>
<td>-.143*</td>
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<td>8. General Ed Classroom</td>
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<td>.136*</td>
<td>.190**</td>
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<td>.391**</td>
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<td>.417**</td>
<td>.357**</td>
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<tr>
<td>15. NonEvocative</td>
<td>.441**</td>
<td>.445**</td>
<td>.410**</td>
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<td>16. Materials</td>
<td>.155*</td>
<td>.177**</td>
<td>.173**</td>
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<td>17. Positive Climate</td>
<td>.104</td>
<td>.455**</td>
<td>.347**</td>
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<tr>
<td>18. Negative Climate</td>
<td>.123</td>
<td>.313**</td>
<td>.248**</td>
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<td>19. SLP Sensitivity</td>
<td>-.008</td>
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<td>.176**</td>
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<td>20. Regard for Students</td>
<td>.446**</td>
<td>.344**</td>
<td>.436**</td>
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<tr>
<td>21. Concept Development</td>
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<td>.656**</td>
<td>.753**</td>
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<td>22. Quality of Feedback</td>
<td>-</td>
<td>1</td>
<td>.804**</td>
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<td>23. Language Modeling</td>
<td>-</td>
<td>-</td>
<td>1</td>
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</tbody>
</table>
Table 4

*Children's Primary Group Size for Therapy Sessions*

<table>
<thead>
<tr>
<th>Primary Grouping</th>
<th># of Children (Percentage of Sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>17 (7.3%)</td>
</tr>
<tr>
<td>Small Group (2-4 in group)</td>
<td>144 (61.8%)</td>
</tr>
<tr>
<td>Large Group (5-7 in group)</td>
<td>5 (2.1%)</td>
</tr>
<tr>
<td>XLarge Group (&gt; 7 in group)</td>
<td>2 (0.9%)</td>
</tr>
<tr>
<td>Mixed</td>
<td>65 (27.9%)</td>
</tr>
</tbody>
</table>

*Note:* Primary Grouping was defined as the grouping size for 70% or more of a child's therapy sessions; Mixed = Children who didn't have one primary grouping.
Table 5

*Model Fit Indices for Latent Profile Analysis Models*

<table>
<thead>
<tr>
<th>Model</th>
<th>-2LL</th>
<th>Free Parameters</th>
<th>AIC</th>
<th>BIC</th>
<th>Entropy</th>
<th>VLMR p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 groups</td>
<td>-5704.98</td>
<td>19</td>
<td>11447.96</td>
<td>11513.53</td>
<td>0.994</td>
<td>.00</td>
</tr>
<tr>
<td>3 groups</td>
<td>-5514.60</td>
<td>26</td>
<td>11081.19</td>
<td>11170.92</td>
<td>0.966</td>
<td>.00</td>
</tr>
<tr>
<td>4 groups</td>
<td><strong>-5371.13</strong></td>
<td><strong>33</strong></td>
<td><strong>10808.25</strong></td>
<td><strong>10922.14</strong></td>
<td><strong>0.975</strong></td>
<td><strong>.00</strong></td>
</tr>
<tr>
<td>5 groups</td>
<td>-5307.76</td>
<td>40</td>
<td>10695.51</td>
<td>10833.55</td>
<td>0.983</td>
<td>.00</td>
</tr>
<tr>
<td>6 groups</td>
<td>-5220.34</td>
<td>47</td>
<td>10534.69</td>
<td>10696.89</td>
<td>0.984</td>
<td>.00</td>
</tr>
<tr>
<td>7 groups</td>
<td>-5148.90</td>
<td>54</td>
<td>10405.81</td>
<td>10592.16</td>
<td>0.986</td>
<td></td>
</tr>
<tr>
<td>8 groups</td>
<td>-5124.48</td>
<td>61</td>
<td>10370.96</td>
<td>10581.47</td>
<td>0.985</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* The bolded group (group 4) was identified as the best fitting model as indicated by significant reductions in -2LL, AIC, and BIC indicators.
Table 6

*Percentage of Weeks Children's SLPs Collaborated with the Classroom Teacher*

<table>
<thead>
<tr>
<th>Percentage of Weeks</th>
<th># of Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>14</td>
</tr>
<tr>
<td>1 - 25%</td>
<td>116</td>
</tr>
<tr>
<td>26 - 50%</td>
<td>47</td>
</tr>
<tr>
<td>51 - 75%</td>
<td>33</td>
</tr>
<tr>
<td>&gt; 75%</td>
<td>23</td>
</tr>
</tbody>
</table>
Table 7

*Materials Used in Each Therapy Session (n = 358)*

<table>
<thead>
<tr>
<th>Materials</th>
<th># of Sessions</th>
<th>% of Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Cards</td>
<td>192</td>
<td>53.6</td>
</tr>
<tr>
<td>Worksheets</td>
<td>160</td>
<td>44.7</td>
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<tr>
<td>Writing Tools</td>
<td>151</td>
<td>42.2</td>
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<tr>
<td>Books</td>
<td>135</td>
<td>37.7</td>
</tr>
<tr>
<td>Arts &amp; Crafts</td>
<td>131</td>
<td>36.6</td>
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<tr>
<td>Office Supplies</td>
<td>104</td>
<td>29.1</td>
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<tr>
<td>Games</td>
<td>98</td>
<td>27.4</td>
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<tr>
<td>Real Objects</td>
<td>64</td>
<td>17.9</td>
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<tr>
<td>Manipulatives</td>
<td>47</td>
<td>13.1</td>
</tr>
<tr>
<td>Technology</td>
<td>39</td>
<td>10.9</td>
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<tr>
<td>Food</td>
<td>39</td>
<td>10.9</td>
</tr>
<tr>
<td>Toys</td>
<td>27</td>
<td>7.5</td>
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<tr>
<td>Mirror</td>
<td>12</td>
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<td>PictureSchedule</td>
<td>8</td>
<td>2.2</td>
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<td>Graphic Organizer</td>
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<td>1.7</td>
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<tr>
<td>Costumes</td>
<td>4</td>
<td>1.1</td>
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<tr>
<td>AX Tools</td>
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<td>0.8</td>
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<tr>
<td>Music</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Oral Motor</td>
<td>0</td>
<td>0</td>
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</table>

*Note:* Each material was coded once for use in a particular session.
Table 8  

*Number of Sessions and Average Time SLPs Use Various Forms of Direction (n = 358).*

<table>
<thead>
<tr>
<th>Direction</th>
<th># of Sessions</th>
<th>Avg Time (% of Session)</th>
<th>SD</th>
<th>Range</th>
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</thead>
<tbody>
<tr>
<td>Joint: SLP-Led</td>
<td>354</td>
<td>20.98 (89.62)</td>
<td>6.6</td>
<td>0 - 37.70</td>
</tr>
<tr>
<td>SLP-Focused</td>
<td>77</td>
<td>.88 (3.67)</td>
<td>2.4</td>
<td>0 - 25.59</td>
</tr>
<tr>
<td>Joint: Child-Led</td>
<td>54</td>
<td>.67 (2.98)</td>
<td>2.0</td>
<td>0 - 17.75</td>
</tr>
<tr>
<td>Null</td>
<td>29</td>
<td>.48 (2.06)</td>
<td>1.6</td>
<td>0 - 22.28</td>
</tr>
<tr>
<td>Child-Focused</td>
<td>20</td>
<td>.23 (.94)</td>
<td>.99</td>
<td>0 - 10.45</td>
</tr>
<tr>
<td>Peer</td>
<td>11</td>
<td>.10 (.39)</td>
<td>.52</td>
<td>0 - 5.61</td>
</tr>
<tr>
<td>Technology</td>
<td>3</td>
<td>.05 (.28)</td>
<td>.66</td>
<td>0 - 11.66</td>
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*Note.* Time is denoted in minutes.
Table 9

Time Spent on Targets Within Therapy Sessions per Child \((n = 233)\)

<table>
<thead>
<tr>
<th>LIOS Targets</th>
<th>Sum of 2 Sessions</th>
<th>Average of 2 Sessions</th>
</tr>
</thead>
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<tr>
<td></td>
<td>(M)</td>
<td>(SD)</td>
</tr>
<tr>
<td>Language Targets</td>
<td>23.89</td>
<td>10.26</td>
</tr>
<tr>
<td>Management</td>
<td>9.03</td>
<td>4.11</td>
</tr>
<tr>
<td>Null</td>
<td>9.95</td>
<td>5.43</td>
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</table>

*Note.* Management and Null are included as a point of reference; these values were not used in any additional analyses.
Table 10

*Count of Techniques Used within Sessions (n=358)*

<table>
<thead>
<tr>
<th>Techniques</th>
<th># of Sessions</th>
<th>Mean</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language Models</td>
<td>356</td>
<td>43.61</td>
<td>11</td>
<td>0 to 156</td>
</tr>
<tr>
<td>Leading Questions</td>
<td>348</td>
<td>49.65</td>
<td>49</td>
<td>0 to 183</td>
</tr>
<tr>
<td>Reinforcements</td>
<td>341</td>
<td>15.58</td>
<td>13</td>
<td>0 to 65</td>
</tr>
<tr>
<td>Visual Cue</td>
<td>339</td>
<td>43.51</td>
<td>32</td>
<td>0 to 289</td>
</tr>
<tr>
<td>Leading Statements</td>
<td>333</td>
<td>13.10</td>
<td>9</td>
<td>0 to 80</td>
</tr>
<tr>
<td>Cloze Procedure</td>
<td>316</td>
<td>10.37</td>
<td>7</td>
<td>0 to 76</td>
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<tr>
<td>Wait Time</td>
<td>285</td>
<td>5.26</td>
<td>3</td>
<td>0 to 7</td>
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<tr>
<td>Imitation</td>
<td>243</td>
<td>4.79</td>
<td>2</td>
<td>0 to 95</td>
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<tr>
<td>Choices</td>
<td>228</td>
<td>2.60</td>
<td>1</td>
<td>0 to 46</td>
</tr>
<tr>
<td>Phonemic Cue</td>
<td>194</td>
<td>2.25</td>
<td>1</td>
<td>0 to 34</td>
</tr>
<tr>
<td>Directing Attention</td>
<td>184</td>
<td>1.73</td>
<td>1</td>
<td>0 to 26</td>
</tr>
<tr>
<td>Tactile Cue</td>
<td>52</td>
<td>0.44</td>
<td>0</td>
<td>0 to 24</td>
</tr>
<tr>
<td>Think Aloud</td>
<td>30</td>
<td>0.15</td>
<td>0</td>
<td>0 to 7</td>
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Table 11

<table>
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<th>Techniques</th>
<th>M</th>
<th>Median</th>
<th>Mode</th>
<th>Range</th>
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<tr>
<td>Total Techniques</td>
<td>392.96</td>
<td>377</td>
<td>364</td>
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</tr>
<tr>
<td>NonEvocative</td>
<td>212.75</td>
<td>198</td>
<td>136</td>
<td>11 - 588</td>
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<tr>
<td>Evocative</td>
<td>180.21</td>
<td>181</td>
<td>213</td>
<td>13 - 405</td>
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</table>

*Note.* Data are a sum of two therapy sessions for each child (n=233).
Table 12

*Average Instructional and Emotional Quality Across 2 Therapy Sessions (n = 233)*

<table>
<thead>
<tr>
<th>Instructional Quality Indicators</th>
<th>$M$</th>
<th>$SD$</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept Development</td>
<td>2.83</td>
<td>.99</td>
<td>1.0 - 5.5</td>
</tr>
<tr>
<td>Quality of Feedback</td>
<td>3.70</td>
<td>1.01</td>
<td>1.50 - 6.0</td>
</tr>
<tr>
<td>Language Modeling</td>
<td>3.11</td>
<td>.91</td>
<td>1.0 - 5.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emotional Quality Indicators</th>
<th>$M$</th>
<th>$SD$</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Climate</td>
<td>5.44</td>
<td>.69</td>
<td>3.0 - 7.0</td>
</tr>
<tr>
<td>Negative Climate (Reverse)</td>
<td>6.89</td>
<td>.27</td>
<td>5.5 - 7.0</td>
</tr>
<tr>
<td>SLP Support</td>
<td>5.47</td>
<td>.71</td>
<td>3.0 - 7.0</td>
</tr>
<tr>
<td>Regard for Student's Perspective</td>
<td>4.16</td>
<td>.87</td>
<td>2.0 - 6.0</td>
</tr>
</tbody>
</table>

*Note:* All indicators are scored on a 7-point scale with 1 being low quality and 7 being high quality.
Table 13

*Correlations Between Language Gain and Factors of Speech-Language Therapy*

<table>
<thead>
<tr>
<th></th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Language Gain</td>
<td>-.078</td>
<td>.031</td>
<td>-.044</td>
<td>-.019</td>
<td>.062</td>
</tr>
<tr>
<td>2. Internal Structure</td>
<td>-</td>
<td>-.105</td>
<td>.502**</td>
<td>.108</td>
<td>.086</td>
</tr>
<tr>
<td>3. External Structure</td>
<td>-</td>
<td>-</td>
<td>-.112</td>
<td>-.017</td>
<td>.116</td>
</tr>
<tr>
<td>4. Instructional Quality</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.304**</td>
<td>.148**</td>
</tr>
<tr>
<td>5. Emotional Quality</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.222**</td>
</tr>
<tr>
<td>6. Inclusion</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>
Table 14

*Regression Model of Therapy Factors Predicting Language Gain*

<table>
<thead>
<tr>
<th></th>
<th>β Coefficient (SE)</th>
<th>β Coefficient</th>
<th>$t$</th>
<th>$p$</th>
<th>Partial</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.000 (.008)</td>
<td>.027</td>
<td>.978</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Structure</td>
<td>-.009 (.010)</td>
<td>-.077</td>
<td>-.991</td>
<td>.323</td>
<td>-.067</td>
<td>-.066</td>
</tr>
<tr>
<td>External Structure</td>
<td>.002 (.008)</td>
<td>.013</td>
<td>.193</td>
<td>.847</td>
<td>.013</td>
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</tr>
<tr>
<td>Instructional Quality</td>
<td>-.001 (.010)</td>
<td>-.007</td>
<td>-.091</td>
<td>.927</td>
<td>-.006</td>
<td>-.006</td>
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<tr>
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<td>-.024</td>
<td>-.336</td>
<td>.737</td>
<td>-.023</td>
<td>-.023</td>
</tr>
<tr>
<td>Inclusion</td>
<td>.009 (.009)</td>
<td>.294</td>
<td>1.053</td>
<td>.294</td>
<td>.071</td>
<td>.071</td>
</tr>
</tbody>
</table>
Table 15

*Regression Model of Therapy Features Predicting Language Gain*

<table>
<thead>
<tr>
<th></th>
<th>β Coefficient (SE)</th>
<th>β Coefficient</th>
<th>t</th>
<th>p</th>
<th>Partial</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.041 (.042)</td>
<td>-.982</td>
<td>.327</td>
<td></td>
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</tr>
<tr>
<td>Large Group</td>
<td>-.002 (.001)</td>
<td>-.147</td>
<td>-2.188</td>
<td>.030</td>
<td>-.146</td>
<td>-.142</td>
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<td>Typical Peers</td>
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<td>.148</td>
<td>2.247</td>
<td>.026</td>
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<td>.146</td>
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<tr>
<td>Evocative Strategies</td>
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<td>-1.582</td>
<td>.115</td>
<td>-.106</td>
<td>-.103</td>
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<tr>
<td>RSP</td>
<td>.015 (.009)</td>
<td>.112</td>
<td>1.678</td>
<td>.095</td>
<td>.112</td>
<td>.109</td>
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</tbody>
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*Note.* Standardized Coefficients are reported to facilitate interpretation across predictors of Language Gain. RSP = Regard for Student Perspective
Figure 1. Latent Profile Analysis of Service Delivery Models
Figure 2. Exploratory Factor Analysis of Features of Speech-Language Therapy
## Appendix B

### Example Therapy Log

<table>
<thead>
<tr>
<th>Student's Name:</th>
<th>Day of Week</th>
<th>Start Time</th>
<th>End Time</th>
<th>No Therapy Scheduled</th>
<th>Student Absent</th>
<th>Therapy cancelled</th>
<th># Other Students</th>
<th>Group composition*</th>
<th>Therapy Location**</th>
<th>Contact with Parent/Caregiver? ***</th>
<th>Contact with other Teacher? ***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SG MG IN IEPs</td>
<td>SR GEN SPED</td>
<td>Circle all That Apply</td>
<td>Circle all That Apply</td>
</tr>
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<td></td>
<td>Tu</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>SR GEN SPED</td>
<td>NA L P E SV HW CV</td>
<td>NA L P E SV HW CV</td>
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<td>SR GEN SPED</td>
<td>NA L P E SV HW CV</td>
<td>NA L P E SV HW CV</td>
</tr>
</tbody>
</table>

*Group Composition Codes:  NA = not applicable  SG = Same grade  MG = Multi grade  IN = includes students w/o IEPs  IEPs = All students in group have

**Therapy Location Codes:  SR = Speech Room  GEN = General Education Classroom  SPED = Special Education Classroom (resource room, self-contained)  OL = other Location (hallway, library, etc)

***Contact Type Codes:  NA = none  L = letter/ note  P = Phone call  E = Email  HV = Home visit  SV = School visit  HW = Homework folder  CV = Classroom visit or