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Teaching Literacy Using a Multiple-Linguistic Word-Study Spelling Approach: A Systematic Review

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Tim is a 10-year-old, fourth-grade boy who has completed a language and literacy assessment with his school's multi-disciplinary team. Since first grade, Tim has received speech and language services for oral syntax and semantics, and special education services for reading. Tim's most recent assessment revealed that he has deficits in semantics, reading decoding, reading comprehension, writing, and spelling. The speech-language pathologist (SLP) found that Tim's phonological awareness skills and morphological awareness skills were below what is expected of a child his age. Specifically, Tim had difficulty segmenting phonemes. When he was administered a morpheme generation task in which he was given a base word (e.g., explode) and was asked to use this word to fill in a sentence (e.g., The loud sound was caused by the _____. explosion), he was not able to generate an appropriate word derivative (e.g., explode – explosion).

Given this assessment picture, the SLP is faced with the task of determining appropriate treatment that will make the biggest impact on Tim's academic success and of coordinating these services with the other members on the multi-disciplinary team. She recently heard of using multiple-linguistic word study as a way to facilitate the language components of morphological awareness and phonological awareness, and is interested in determining whether such an approach may help Tim in his phonological, morphological, semantic, and literacy success.

Before we address Tim's specific case, let's take a brief look at what is meant by a multiple-linguistic word-study approach, define the underlying language principles of such an approach, and briefly summarize the research of each linguistic principle in relationship to language and literacy achievement.

Multiple-Linguistic Word Study Defined

Word study, specifically the linguistic analysis and focus on spelling, may provide a valuable language-based tool for the SLP when assessing and treating children with language-literacy deficits (LLD). Spelling is a language-based skill (Bailet, 2004) and the awareness of sounds in words (phonological awareness), knowledge of the spelling patterns in words (orthographic knowledge), and understanding of relationships among base words and their inflectional and derivational forms (morphological awareness) all influence spelling acquisition, vocabulary, reading decoding, reading comprehension, and writing development (Apel, Masterson, & Neissen, 2004; Bourassa & Treiman, 2001). A developmental treatment approach that incorporates spelling and nurtures these multiple linguistic factors may be an effective way to facilitate language and literacy success for children with LLD.

Phonemic awareness is an integral part of literacy development because it best predicts reading and spelling achievement.

Because word study involves the practice of analyzing and facilitating spelling, SLPs often view this as a skill outside their scope of practice. However, it can be argued that when spelling-based word study is used as a tool to assess and facilitate language-specific goals, it can provide an assessment window to determine where linguistic breakdowns occur and a tool to prescriptively facilitate the linguistic underpinnings of phonemic awareness, morphological awareness, and/or orthographic knowledge. Given the SLPs' expanding scope of practice, which includes written language (ASHA, 2001), assessment, and treatment approaches such as spelling that may facilitate language development in multiple areas of vocabulary, reading, and writing are appropriate and a welcome interpretation and therapy tool.

Phonological Awareness

Phonological awareness is the ability to recognize and store linguistic codes or phonemes and later retrieve and produce them in an appropriate manner. Phonemic awareness is a subcategory of phonological awareness that is specific to manipulation, blending, and segmenting of phonemes. For example, the word *cat* phonemically

segmented is /k/-/æ/-/t/. Phonemic awareness is an important and integral part of literacy development because it best predicts reading and spelling achievement (Catts, Fey, Zhang, & Tomblin, 2001). A reciprocal relationship exists between phonemic awareness and literacy development: phonemic awareness strengthens literacy skills while reading and spelling strengthen skills in phonemic awareness. An impressive body of research documents the crucial role of phonemic awareness in reading and spelling (e.g., Bird, Bishop, & Freeman, 1995; Lonigan, Burgess, & Anthony, 2000; Storch & Whitehurst, 2002).

Orthographic Knowledge

Orthographic knowledge involves the translation of sounds to letter(s), or phonemes to graphemes, which requires the knowledge and use of general spelling rules and patterns (e.g., long- and short-vowel rules). For example, the vowel in the word *cat* is pronounced as a short vowel and spelled with the single consonant of a, which is consistent with the short-vowel-a spelling rule. Additional factors involved in orthographic processing may include the implicit appreciation for orthotactic, or positional, constraints on the sequences of graphemes that are used in words (e.g., ck cannot occur at the beginning of an English word). Researchers believe that children use their orthographic knowledge of individual letters, letter sequences, and spelling patterns to recognize words visually while reading and spelling (Ehri, 1992; Share, 2004).

Apel and Masterson (2001) have presented a model in which phonological knowledge is connected to orthographic knowledge (i.e., sound-letter correspondence) to form images of words referred to as Mental Orthographic Representations (MORs). This is based on the work of Ehri (1980), who hypothesized that children develop MORs by making connections between graphemes and corresponding phonemes as they sound out novel words. The establishment of these phoneme–grapheme relations results in the ability of children to bond spelling (orthography) to pronunciation of words (phonology). According to Ehri, these orthographic images develop gradually as the child develops a more complete awareness of the alphabetic system, phoneme–grapheme correspondences, and consistent identification of across-word patterns.

Researchers have documented the importance of orthographic knowledge in literacy development (e.g., Apel, Wolter, & Masterson, 2006; Cunningham, 2006; Evans, Williamson, & Pursoo, 2008). Additionally, this skill has been associated with children's development of reading-word recognition and spelling (Ehri & Saltmarsh, 1995; Share, 2004).

Morphological Awareness

Morphological awareness can be defined as the awareness of the morphemic structure and the ability to reflect on and manipulate that structure. Morphemes are the smallest units of words that carry meaning. For example, the word *cats* is composed of two morphemes, the base word *cat* and the plural *–s* morpheme. Morphological knowledge includes a knowledge of *inflections* (i.e., affixes to root words that indicate grammatical information such as tense or number, such as *help* plus *–ed*) and *derivational forms* (i.e., changes to the base word to create a new word, which generally change the grammatical category, such as *sad* to *sadness*).

Morphological awareness is correlated with a well-developed grammar system, increased vocabulary development, and high reading achievement (e.g., Carlisle & Nomanbhoy, 1993; Nagy, Berninger, & Abbott, 2006). Specifically, knowledge of morphology helps children to spell, decode, and comprehend new words (e.g., Carlisle, 1996, 2000; Elbro & Arnback, 1996; Windsor, 2000). This is not surprising given that approximately 60% of new words acquired by school-age children are morphologically complex (Anglin, 1993).

Multiple-Linguistic Word-Study Spelling

Researchers have recognized the importance of phonological awareness, orthographic knowledge, and morphological awareness in children's language and literacy development. As a result, these factors have been integrated into word-study spelling instructional programs and practices (Bear, Invernizzi, Templeton, & Johnson, 2004; Wasowicz, Apel, Masterson, & Whitney, 2004).

These types of instructional approaches focus on applying multiple-linguistic strategies (phonologically segmenting, referring to an orthographic spelling rule, or utilizing the morphological knowledge of a base word) during the spelling process. For example, in an orthographic knowledge lesson, children may be asked to differentiate between spellings of the long-vowel-*o*

pronunciation, spelled with the two-vowel orthographic pattern of *oa* (e.g., words such as *boat, goat, float*) and the short-vowel-*o* pronunciation spelled with the single-vowel orthographic pattern of *o* (e.g., words such as *hot, lot, pot*). By sorting the words according to the orthographic pattern, children create their own meaning and ultimately learn the orthographic rule.

The oft-heard criticism that "written language interventions are not in the SLP's scope of practice" is, at the very least, questionable.

Given the nature, scope, and relationship between phonological, orthographic, and morphological dimensions of language literacy, the oft-heard criticism that "written language interventions are not in the SLP's scope of practice" is at the very least questionable.

Purpose

Although a multiple-linguistic word-study spelling approach is grounded in theory and research (Hall, Cunningham, & Cunningham, 1995), limited research has been conducted to examine the effectiveness of such an approach on the language and literacy success of children with LLD. A small number of recently published studies have specifically examined the effectiveness of multiple-linguistic spelling word-study treatment. Although findings appear positive for the use of such an approach, the value of these studies is limited because they either offer only qualitative evidence without any statistical supporting evidence (Darch, Kim, Johnson, & James, 2000; Williams & Hufnagel, 2005; Williams & Philips-Birdsong, 2006) or they are published in edited publications, such as books (Apel, Masterson, & Hart, 2004; Berninger et al., 2003; Wolter, 2005). The purpose of this brief is to provide a systematic review of the recent peer-reviewed quantitative research that focuses on language and literacy outcomes in school-age children using a multiple-linguistic spelling instructional approach. Following this review is a discussion of how these review results would be applied to an evidence-based practice (EBP) decision-making process by the school SLP who is providing Tim's intervention program.

Method

Formulating the Clinical Question

The first step in the systematic review process is to formulate a clinical question focusing on a multiple-linguistic word-study treatment approach. The research question for the present brief is: Does a multiple-linguistic word-study spelling intervention approach improve written language success for school-age children with and without LLD?

Inclusion Criteria

An initial general search in an electronic database of the research on a multiple-linguistic word-study instruction revealed limited treatment research with a focus on all linguistic areas (phonological awareness, orthographic knowledge, and morphological awareness), and thus the following inclusionary criteria were used as a way to include an adequate amount of research with a focus on the specified research question:

- Studies were included if word-study spelling instruction was focused on one or more linguistic variables (phonological awareness, orthographic knowledge, or morphological awareness).
- Given the limited available research, a decision was made to include children with LLD, as well as typical children.
- Case studies, single-group, or single-subject designs in addition to the preferred quasi-experimental or experimental randomized control trials were included.
- Only quantitative research was chosen as a way to discuss statistically related findings (practical significance and/or statistical significance) across all research.
- Study outcomes needed to extend beyond spelling achievement and include those of other language literacy factors such as reading decoding, reading comprehension, reading-word recognition, and/or writing.
- Only research was chosen that included school-aged participants whose first language was English.
- All research needed to be published in a peer-reviewed journal within the last 10 years.

Article Search

An initial search was conducted using the Educational Resources Information Center (ERIC), Professional Development Collection, Psychology and Behavioral

Sciences, Social Sciences, Teacher Reference Center, and PsycInfo. The search terms included the keywords "spelling instruction" or "word study" combined with the keywords of "language," "phonological awareness," "orthographic knowledge," or "morphological awareness." This search was followed by a similar search on the American Speech Language Hearing (http://www.asha.org) website, as well as the What Works Clearinghouse (http://ies.ed.gov/ncee/wwc/). The search of all databases resulted in identification of 2,026 citations. A hand search also was conducted in which the reference lists were reviewed in relevant articles, research, and systematic reviews on spelling (Reed, 2008; Wanzek, Vaughn, Wexler, Swanson, Edmonds, & Kim, 2006). Articles were excluded from the review if their abstracts and/or titles indicated that they did not meet all of the inclusionary criteria.

Following the complete search, 56 full-text articles were retrieved and reviewed. The content of each of these articles was skimmed and it was determined that 43 of the 56 articles failed to meet one or more of the inclusionary criteria. The 13 remaining studies were included for the present review (see Table 1). Listed studies are organized according to the levels of evidence from the American Speech Language Hearing Association's (2006) standards, with randomized controlled trials being the highest level of evidence.

Research Quality

The methodological quality of the included studies was assessed and systematically appraised according to eight attributes that are associated with high-quality research (Gillam & Gillam, 2006). (See Table 2.) These attributes helped to substantiate that the research findings were due to the experimental treatment and not some other factor(s) (e.g., control group differences, random assignment to groups). The following quality-appraisal attributes were used to assess the quality of the studies retrieved and included in this review:

- Use of a comparison control group(s) or treatment group(s)
- Random participant assignment to treatment or control group(s)
- Limited differences or variance between the control and treatment group(s) for a clear statistical comparison
- Sufficient information regarding the participant sample, which would allow a clinician to adequately determine whether a client matched the description of the participant sample and/or replicate the study
- Inclusion of reliable and valid outcome measures to ensure the researchers consistently and accurately measured what they purported to measure
- Use of blind examiners (individuals who conduct assessments or analyze data without knowledge of the participant treatment group)
- Inclusion of comparison statistics and effect sizes to allow the researcher(s) to quantify the probability that the results were due to at least a 5% chance ($p < .05$)
- Inclusion of effect sizes to interpret practical clinical significance on a 0 to 1.0 plus scale. Effect sizes can indicate little clinical significance (0.2), moderate clinical significance (0.5), or large clinical significance (0.8).

Although researchers have yet to reliably determine how to weight these quality judgments, we can take a summative assessment approach in that the more quality-appraisal attributes included in a study, the more we can trust that the research was replicable, reliable, valid, and generalizable.

In our review for Tim, we can surmise that the randomized controlled trials have the most quality-appraisal points and provide the most reliable and generalizable of evidence, compared to the case studies with the least amount of appraisal points. Although the results from 13 case studies are applicable to Tim given the participant similarities to his specific case, we need to verify the case study findings with results of control trials with and without randomization that include a larger number of participants with varied abilities and that control for bias through measures such as blinded evaluators.

Research Integration

With the 13 included studies in hand, the following literacy outcomes of a multiple-linguistic word-study approach were reported.

Reading and Spelling Outcomes

For those studies in which reading and spelling were both outcome variables, multiple-linguistic word-study spelling treatments resulted in increased word-level

reading recognition, decoding, and/or spelling abilities for children with and without LLD (Abbott & Berninger, 1999; Apel & Masterson, 2001; Berninger et al., 1998, 1999, 2002, 2008; Blachman et al., 1999; Kelman & Apel, 2004). A commonality across the studies was the inclusion of the linguistic factors of phonemic awareness and orthographic knowledge in explicit word-study spelling activities. Phonemic awareness activities linked to spellings and orthographic knowledge word-sorts appeared to facilitate children's literacy development. For example, phonemic segmenting activities linked to orthographic spellings were found to increase the word-level reading and/or spelling abilities in children ages 10, 11, and 13 with language-literacy deficits (Apel & Masterson, 2001; Kelman & Apel, 2004; Masterson & Crede, 1999). These case study findings were further supported by randomized controlled studies in which treatment comparisons were made. Berninger et al. (1999) examined phonemic blending activities linked to orthographic knowledge and found that activities that focused on matching phonemes to specific letters (/p/ matched to the letter *p*) or letter combinations (e.g., /i/ matched to the letters *ee;* /sl/ matched to the letters *sl*) were more effective in increasing scores for reading-word recognition than phonemic blending activities that focused on matching blended phonemes to whole words (e.g., /s/-/l/-/i/-/p/ blended to /slip/ to the written word *sleep*) for first-grade children with reading deficits. Moreover, when third-grade children with low writing scores (Berninger et al., 2002), and second-grade children in a different study with low spelling scores (Graham & Harris, 2005) were explicitly taught phoneme–orthographic correspondences (e.g., different ways to spell /k/, /j/, /z/) and various orthographic rules (e.g., short- versus long-vowel rules), children in both studies performed significantly better on spelling and reading measures compared to control groups that did not receive linguistically based word-study spelling instruction.

A commonality across the studies was the inclusion of the linguistic factors of phonemic awareness and orthographic knowledge.

The addition of a morphological awareness linguistic component also appeared to facilitate reading and spelling development. Morphological awareness instruction that focused on inflectional and derivational affixes, whether presented orally only or linked to written spellings, significantly improved seven- and eight-year-old children's spelling of morphologically based words compared to control groups that received phonological awareness instruction (phoneme manipulation, blending), and in some cases, an orthographic knowledge component (short- versus long-vowel spelling rules; Nunes et al., 2003). Nunes et al. (2003) found that children receiving any of the linguistically based treatments (morphological awareness orally, morphological awareness linked to spelling, phonological awareness orally, phonological awareness linked to spelling and orthographic knowledge) increased their reading and spelling abilities. Berninger et al. (2008) further supported the inclusion of morphological awareness with the finding that children with dyslexia in fourth to ninth grades receiving a morphological awareness spelling treatment improved in their ability to read and spell pseudowords, which indicated a generalization of spelling learning.

Additionally, studies by Vadasy et al. (2005) lend support to the use of all three linguistic components (phonological, orthographic, and morphological) for reading and spelling improvement in a word-study spelling instructional approach. In Study 1, which was conducted with second-grade children who had low average reading scores, the researchers found that a multiple-linguistic approach with an additional reading component in which children read words that reflected newly learned phonological, orthographic, or morphological spelling patterns significantly increased the reading skills of decoding, recognition, fluency, and comprehension, in addition to spelling abilities. Interestingly, a subsequent randomized study of second- and third-grade children who had low average reading scores resulted in strong effect sizes for reading decoding, recognition, and fluency only, *without* effects for spelling and reading comprehension. This discrepancy possibly could be explained by different grade-level needs in Studies 1 and 2. In Study 1, only second-grade children were included, whereas in Study 2, both second- and third-grade children were included. Given that the importance of morphological awareness in spelling accuracy surpasses that of orthographic knowledge in third grade (Green, McCutchen, Schwiebert, Quilan, Eva-Wood, & Juelis, 2003), possibly more morphologically based lessons were needed at the third-grade level to increase spelling and the morphologically related skill of reading comprehension.

Children receiving any of the linguistically based treatments increased their reading and spelling abilities.

Writing Outcomes

Linguistically based word-study spelling treatments appeared to be successful in increasing children's writing abilities (Berninger et al., 1998, 2002, 2008; Graham & Harris, 2005; Nunes et al., 2003). When linguistically based instruction was linked to children's writings and new spellings were practiced in written compositions, writing improved in children with language literacy deficits in second grade (Berninger et al., 1998) and fourth through ninth grade (Berninger et al., 2008), regardless of the type of linguistically based instruction used. Also noteworthy were studies in which writing improved following a linguistically based spelling treatment without a written composition component in third-grade children with low compositional writing skills (Berninger et al., 2002) and second-grade children with low spelling skills (Graham & Harris, 2005).

Writing improved in children with language literary deficits in second grade regardless of the type of linguistically based instruction used.

Implications for Tim

Along with careful consideration of the EBP components of research evidence, clinical expertise, and Tim's individual needs, the research in the present review lends itself toward the use of a multiple-linguistic word-study approach for Tim. A systematic review of the research indicates that a multiple-linguistic spelling word-study remediation component in literacy intervention may be a useful linguistic addition that positively contributes toward young school-age children's literacy progress. Specifically, the inclusion of the linguistic factors of phonemic awareness and orthographic knowledge in explicit word-study spelling activities appears to facilitate improved word-level reading decoding, recognition, and spelling abilities in young school-age children with and without LLD. Additionally, morphological awareness appears to benefit literacy development in children as young as second grade and as advanced as seventh grade; however, more research needs to be conducted in this area to replicate these findings. Thus, Tim appears to be an ideal candidate for language treatment with a multiple-linguistic word-study approach that focuses on the language links between phonological awareness (sounds) and orthographic knowledge (spellings). Moreover, given Tim's difficulties in morphological awareness and his advanced elementary grade level, he may very likely benefit from an additional morphological awareness word-study focus. In addition, in order to aid in Tim's literacy development, this multiple-linguistic word-study instruction should include opportunities to practice new linguistic strategies in a single-word reading and written context since the evidence suggests that school-age children's writing and reading improves when linguistically based word-study spelling instruction is linked to written composition and reading practice.

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Table 1. Descriptions and Outcomes of Research Studies

Study	Design	Sample Description	Intervention/ Comparison	Intensity/Duration/ Groups	Language Outcomes	Findings
Level Ib (Randomized Control Trial) and Level IIa (Controlled Without Randomization) Evidence (ASHA)						
Abbott & Berninger (1999)	Randomized Control Trial	20 children Grades 4–7 Performed low average in reading	Treatment (Tx) Group: Explicit instruction of morphological awareness and structural analysis of syllables (Henry, 1990) Control Group: Study skills training Both groups received Tx in orthographic knowledge (spelling rules and phoneme–grapheme correspondences), phonological awareness (deletion), decoding (phoneme blending), and reading comprehension.	16 sessions, 1 hour duration, over a 4-month period Individual sessions	Spelling Writing Decoding Word ID Reading comprehension (RC) Phonological Awareness (PA) Orthographic Knowledge (OK)	Children in both treatment (Tx) and control groups significantly improved growth curve in all outcome areas. No significant differences were found on outcome measures between the control group and Tx group which may have been due to decreased power as a result of small group sample sizes and/ or common shared Tx.
Berninger, Abbott, Zook, Ogier, Lemos-Britton, & Brooksher (1999)	Randomized Control Trial	48 children Grade 1 Performed low average in decoding and/or recognition	Tx Groups: Whole Word Tx Word ID , phonological blending activities, matching the whole-word orthographic code to blended sounds Subword Tx Word ID and phonological blending activities, matching orthographic code of single/ multi-letter units to sounds Combined Tx Whole word and subword Tx All Tx groups read connected text	8 sessions, 30 minutes duration, in the summer following 1st grade year, 1 session per week Individual sessions	Spelling Writing Decoding Word ID	Growth curve analysis revealed significant increases in word-level reading for all Tx groups, with the subword Tx resulting in the most effective Tx in word ID scores as measured by a significant interaction of Tx and time. Pre-Tx phonological awareness and orthographic knowledge scores predicted children's success in the all Tx.

continued

Table 1., continued

Study	Design	Sample Description	Intervention/ Comparison	Intensity/Duration/ Groups	Language Outcomes	Findings
Blachman, Tangel, Ball, Black, & McGraw (1999)	Controlled/ Not Randomized	128 children Grade 1 Tx (n = 66) Control (n = 66)	Continued longitudinal study in which Tx group received phonological awareness instruction (Blachman et al., 1994) Tx Group: Phonemic awareness instruction linked to spelling, alphabetic code (orthographic knowledge), and decoding Control Group: Traditional basal-reader program	30-minute daily instruction for first-grade school year. Class instruction	Spelling Decoding Word ID PA	The Tx group performed significantly better than control group on phonemic awareness, spelling, and reading measures.
Abbott (2001)	Controlled/ Not Randomized	16 children Grade 3 Tx Group (n = 8) Control: (n = 8)	Tx Group: Orthographic knowledge focus word-study (Bear, Invernizzi, Templeton, & Johnston, 1996) Control Group: Traditional spelling Tx	45 minutes daily, 1 school-year. Class instruction	Spelling OK	Children receiving word-study spelling instruction with orthographic knowledge focus performed significantly better on orthographic knowledge spelling measures (η_p^2 = .39) (no confidence interval reported), and their spellings reflected more sophisticated orthographic spellings. No significant differences found between children's abilities to produce low/high frequency word spellings.

continued

Table 1., continued

Study	Design	Sample Description	Intervention/ Comparison	Intensity/Duration/ Groups	Language Outcomes	Findings
Berninger et al. (2002)	Randomized Control Trial	96 children Grade 3 Performed low average on writing fluency composition	Tx Groups: Spelling Only: Phonemic awareness and orthographic knowledge Writing Composition Only Executive functioning, information/persuasive writing Combined Spelling and Writing Control: Handwriting, keyboard training, composing practice	24 sessions, 20 minutes duration, over 4-month period Class instruction	Spelling Writing Decoding	For all Tx groups children significantly improved spelling and writing abilities from pre- to post-test performance. Children in the spelling training only program performed significantly better on a decoding test than those children receiving the spelling with compositional writing component. Other performance areas were not significantly different
Nunes, Bryant, & Olsson (2003)	Randomized Control Trial	457 children 7- and 8-year-old children	Tx Groups: (n = 220) Morphological Awareness Training Alone (oral only) Segmenting, blending, manipulating affixes Morphological Awareness Training with Spelling segmenting, blending, manipulating affixes with base words linked to spelling Phonological Awareness Training Alone (oral only) Segmenting, blending, and manipulating phonemes Phonological Awareness with Spelling Linking phoneme segmenting, blending, and manipulating to spelling rules (orthographic knowledge) Control Group: (n = 237) No additional small-group training	12 sessions, weekly Small-group instruction (4–8 children)	Spelling Writing Decoding Word ID Morphological Awareness (MA) OK	For all intervention groups, children performed significantly better than controls on standardized reading measures. For both morphological awareness Tx groups, children performed significantly better than controls on morphologically-based spelling measures, although no significant differences found between groups on morphologically-based reading measures. No significant differences found between groups on orthographic knowledge-spelling and reading.

continued

Table 1., continued

Study	Design	Sample Description	Intervention/ Comparison	Intensity/Duration/ Groups	Language Outcomes	Findings
Graham & Harris (2005)	Randomized Control Trial	60 children Grade 2 Low average spelling	Tx Group: Orthographic knowledge activities with spelling word sorts Control: Math lessons	48 sessions, 20 minutes duration, 3 times a week, for 16 weeks Small-group instruction (2 students)	Spelling Writing Decoding	Tx group outperformed control group on spelling measures immediately (effect sizes range = .66 to 1.05), and 6-months post-Tx (effect sizes range = .70 to 1.07) Tx group outperformed control group on writing (effect size = .78) and decoding (effect size =.82)
Vadasy, Sanders, & Peyton (2005)	Study 1: Controlled/ Not Randomized	Study 1: 31 children Grade 2 Low average reading scores	Study 1: Tx Group: (n = 10) Phonological awareness, orthographic knowledge, morphological awareness, and word ID linked to spelling of sight words. Oral readings which included words of multiple-linguistic linkages. Control: (n =19) No additional tutoring	Study 1: (M = 42.2 hours) 30 minutes duration, 4 days/ week, 20 weeks Individual instruction	Study 1: Spelling Decoding Word ID Reading fluency RC	Study 1: Children in the Tx group significantly improved on a composite of decoding and recognition (d = .86), reading fluency (d = .82), reading comprehension (d = .75), and spelling (d = 1.06) compared to control group
	Study 2: Randomized Control Trial	Study 2: 21 children Grade 2 (n = 6) Grade 3 (n = 15) Low average decoding	Study 2: Tx Group: (n = 11) Phonological awareness, orthographic knowledge, morphological awareness, and word ID linked to spelling of sight words. Oral readings which included words of multiple-linguistic linkages. Control: (n = 10) No additional tutoring	Study 2: (M = 36 hours) 30 minutes duration, 4 days/week, 20 weeks Individual instruction	Study 2: Spelling Decoding Word ID Reading fluency RC	Study 2: Children in the Tx group improved significantly more than the control group on a decoding and recognition composite (d = 1.06), reading fluency (d = 1.09). No significant differences were found between groups on reading comprehension (d = .32), and spelling (d = -.32).

continued

Table 1., continued

Study	Design	Sample Description	Intervention/ Comparison	Intensity/Duration/ Groups	Language Outcomes	Findings
Berninger, et al., (2008)	Randomized Control Trial	Study 1: Grades 4–6 (n = 22) Grades 7–9 (n = 17) Diagnosis Dyslexia	Study 1: Tx Groups: Orthographic Knowledge Spelling Tx (*n* = 20) Morphological Awareness Spelling Tx (*n* = 19) All Tx groups received writing composition instruction	Study 1: 14 sessions, 120 minutes duration, consecutive week days Small-group instruction	Study 1: Spelling Writing Decoding	Study 1: Children who received morphological awareness spelling Tx significantly improved the most on nonword spelling. Children who received orthographic knowledge spelling Tx improved significantly on real word spelling and decoding. All Tx groups significantly improved in spelling and writing.
		Study 2: 24 children Grades 4–6 Diagnosis Dyslexia	Study 2: Language Tx Group: (*n* = 12) Phoneme-grapheme correspondence -applied to decoding, spelling applied in writing, note taking strategies, computer-assisted report writing Nonverbal Control Tx Group: (*n* = 12) Computer-based problem-solving activities	Study 2: 4 small group sessions 180 minutes total Small-group instruction	Study 2: Spelling Writing Decoding	Study 2: Both Tx groups resulted in significantly improved nonword decoding, spelling, and written note-taking.
Level III (Case Study) Evidence (ASHA)						
Masterson & Crede (1999)	Case Study	10:5-year-old male Grade 5 Diagnosed with learning disability	Phonemic Awareness Activities Phonemic segmenting and blending linked to corresponding spelling Orthographic Knowledge Activities Orthographic rule word sorts and focus on the mental graphemic representation of the words	12 sessions, 60-minute duration, 6 weeks, bi-weekly. Individual sessions	Spelling Writing	Significant increases were found in spelling based on non-overlapping SEMs from pretest to post-test. Writing appeared to improve given increased post-Tx percentage of words correct in 4 of 5 writing samples. Inconsistent baselines and unknown reliability prevented effectiveness interpretation of these results.

continued

Table 1., continued

Study	Design	Sample Description	Intervention/ Comparison	Intensity/Duration/ Groups	Language Outcomes	Findings
Apel & Masterson (2001)	Case Study	13-year-old female Grade 8 Diagnosis ADD/ Language-Literacy Deficit	Phonemic Awareness Activities: Phonemic segmentation with written links to spelling Orthographic Knowledge Activities: Orthographic spelling rule word sorts (Bear et al., 2000) Morphological Awareness Activities: Derivational morphology spelling word games Phonemic Decoding Activities Continuous voicing of phonemes when blending words	15 sessions, 90 minute duration, daily, (23 hrs total) Individual instruction	Spelling Writing Decoding Word ID MA PA	Large effect sizes found for the difference in spelling ability pre- and post-test (d = .84). Significant increases in decoding and word ID based on non-overlapping SEMs from pretest to post-test. Marked increases of phonemic awareness and morphological awareness skills pre-test to post-test.
Kelman & Apel (2004)	Case Study	11-year-old female Grade 4 Low average spelling	Tx Groups: Phonemic Awareness Activities: Phonemic segmentation links to spelling Orthographic Knowledge Activities: Orthographic spelling rule word sorts (Bear et al., 2000)	11 sessions, average session 60 minutes), over 8 weeks Individual instruction	Spelling Writing Decoding Word ID	A multiple-linguistic spelling approach resulted in clinically significant increase in spelling abilities (d = .5). Word level decoding and ID skills markedly increased as measured by non-overlapping SEM.

Table 2. Assessment of Methodological Study Quality, Based on Criteria (Gillam & Gillam, 2006)

Study	Comparison group included	Group variance controlled	Random assignment to group(s)	Participant descriptions adequate	Blinding of evaluators	Reliable/valid outcome measures	Statistical significance reported	Practical significance (effect size reported)
Level Ib (Randomized Control Trial) and Level IIa (Controlled without Randomization) Evidence (ASHA)								
Berninger et al. (1998)	yes	yes	yes	yes	no	yes	yes	no
Abbott & Berninger (1999)	yes	yes	yes	yes	no	yes	yes	no
Berninger et al. (1999)	yes	yes	yes	yes	no	yes	yes	no
Blachman et al. (1999)	yes	yes	no	yes	yes	yes	yes	no
Abbott (2001)	yes	yes	no	yes	yes	yes	yes	no
Berninger et al. (2002)	yes	yes	yes	yes	no	yes	yes	no
Nunes et al. (2003)	yes	yes	yes	yes	no	yes	yes	no
Graham & Harris (2005)	yes	yes	yes	yes	no	yes	yes	yes
Vadasy et al. (2005	yes	yes	yes	yes	no	yes	yes	yes
Berninger et al. (2008	yes	yes	yes	yes	no	yes	yes	yes
Level III (Case Study) Evidence (ASHA)								
Masterson & Crede (1999)	no	not applicable	no	yes	no	yes	yes	no
Apel & Masterson (2001)	no	not applicable	no	yes	yes	yes	no	yes
Kelman & Apel (2004)	no	not applicable	no	yes	no	yes	no	yes