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EFFECTS OF MORPHOLOGICAL-BASED INTERVENTION
ON VOCABULARY LEARNING IN SCHOOL-AGE CHILDREN
WITH LANGUAGE LEARNING DIFFICULTIES

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Structured Abstract

Clinical Question: Do school-age children with language learning difficulties who receive morphological-based intervention show improvement in word knowledge relative to a comparison intervention or control condition?

Method: Systematic Review

Sources: ERIC, ASHAWire, PsycINFO, Linguistics and Language Behavior Abstracts (LLBA)

Search Terms: language AND morph* AND intervention, therapy, teaching, instruction, treatment

Number of Studies Included: 5

Primary Results:

Children with language learning difficulties learn the meanings of morphemes that are directly taught during morphological-based intervention.

Children with language learning difficulties who receive morphological-based intervention show generalization of taught derivational morphemes to untaught words.

Children with language learning difficulties have shown clinically significant improvement on standardized vocabulary tests following morphological-based intervention.

Conclusions:

An overall aim of a morphological-based vocabulary intervention is for students to strategically apply their knowledge of derivational morphemes and root words to predict meanings of unknown morphologically complex words. There is high-level evidence supporting the effects of morphological-based instruction on vocabulary for typically developing children. However, additional research is needed to firmly establish the effectiveness of morphological-based strategies for the population of students with language learning difficulties. For these students, there is minimal evidence (primarily case and single-subject studies) that supports incorporating morphological-based strategies as one component within a comprehensive vocabulary intervention program. Additional research is needed to determine the effectiveness of morphological-based approaches compared to other vocabulary approaches.

Effects of Morphological-Based Intervention on Vocabulary Learning in School-Age Children With Language Learning Difficulties

Sara C. Steele

Clinical Scenario

Melinda is a speech-language pathologist who has worked in various educational settings for the past eight years and who currently provides speech-language services for students in grades 4 through 8 in a public school. The majority of students on Melinda's caseload have primary educational diagnoses of learning disability comorbid with language impairment, with goals for improving vocabulary knowledge and expression. Through the years, Melinda has become increasingly concerned with how pervasive her students' vocabulary deficits are and how few words she is able to directly teach over the course of an academic year. In general, her students are not skilled at picking up word meanings on their own, so they require instruction in grade-level general academic vocabulary, and sometimes even basic concept vocabulary. Her students require extensive repetitions and review, not only to encode new meanings in long-term memory but to produce words with the correct phonological sequence. This slow rate of learning limits the number of words she is able to teach. Apart from meaning, in production activities her students often use newly learned words in ways that are not grammatically correct. On top of these spoken language problems, most of her students are not reading or writing at grade-level expectations. So another area of concern is how poorly these students generalize their vocabulary knowledge to literacy tasks.

Because of the varied and extensive needs of her students, Melinda has questions about how best to provide vocabulary-focused interventions. She feels uncertain about whether she should spend therapy time directly teaching word meanings or teaching word-learning strategies, such as use of context clues, so students can learn new words on their own. Melinda recently reached out to other speech-language pathologists in her school district to ask how they approach vocabulary goals. One clinician remarked that she had started teaching prefixes and suffixes and that her students appear to be learning more words than if she just teaches one word at a time. Also, since many academic words have prefixes and suffixes, this technique matches up well with the students' needs. This clinician

also felt that teaching the strategy of breaking words into their parts helps her students learn on their own. Although Melinda has addressed morphology as a grammar goal, she has not systematically targeted the meanings of prefixes or suffixes as part of a vocabulary program.

Melinda remembers that there are three types of bound morphemes: compounding, inflectional, and derivational. Compounding morphemes are two words that form a new meaning when combined (e.g., *tooth* and *brush* to form *toothbrush*). Inflectional morphemes are suffixes that mark tense (e.g., past tense in *hoped*), number (e.g., plural in *toes*), or possession (e.g., possessive in *friend's house*), and they have traditionally been viewed within the grammar component of the speech-language pathology profession (Schuele, 2013). Derivational morphemes are prefixes or suffixes that change parts of speech (e.g., from an adjective to a noun, as in *sad* to *sadness*) or meaning (e.g., from *like* to *dislike*). Growth in derivational morphology occurs later than inflectional morphology and substantially contributes to vocabulary growth beginning in grade 3 (Anglin, 1993), above and beyond other skills such as phonological processing and word reading (McBride-Chang, Wagner, Muse, Chow, & Shu, 2005). For this reason, derivational morphemes are typically the focus of morphological-based vocabulary instruction. However, in addition to vocabulary, derivational morphology has been shown to influence literacy skills including reading comprehension, word recognition, and spelling (Carlisle, 2003; Kuo & Anderson, 2006).

Melinda is eager to learn more about this strategy and look for external scientific evidence to support including a morphological component in her vocabulary intervention with primary and secondary school-age children who have language learning difficulties.

Background

Morphological-based intervention involves targeting children's morphological development in three areas: morphological knowledge, morphological awareness, and morphological analysis (or word analysis). *Morphological*

knowledge is one's implicit knowledge about morphology, which develops early in the expressive language of young children (Smith Gabig, & Zaretsky, 2013). On a more conscious level, *morphological awareness* involves an awareness of and ability to manipulate internal word structures (Smith Gabig, & Zaretsky 2013). Morphological awareness is needed in order for students to use *morphological analysis*, which is a cognitive strategy for determining the meaning of unknown morphologically complex words by using knowledge of words' individual morphemes (Kieffer & Lesaux, 2007). Considering that the majority of new words that school-age students encounter during reading include derivational morphemes (Nagy & Anderson, 1984), the ability to independently analyze these words morphologically is deemed a valuable strategy for self-directed vocabulary growth (Bowers & Kirby, 2010; Kieffer & Lesaux, 2007). Morphological analysis is also included in the vocabulary section of the Common Core State Standards (National Governors Association Center for Best Practices and Council of Chief State School Officers, 2010; Smith Gabig, & Zaretsky, 2013), making it a prioritized focus in many schools nationally.

In recent years, several reviews and meta-analyses have described the effects of morphological-based interventions on literacy skills, including vocabulary, spelling, and reading, for typically developing students (Bowers, Kirby, & Deacon, 2010; Carlisle, 2010; Goodwin & Ahn, 2013; Reed, 2008) and for students with literacy difficulties (Goodwin & Ahn, 2010). Such interventions seek to improve children's knowledge of prefixes/suffixes, bases, compound words, word origins, spoken morphology, written morphology, and spelling patterns (Bowers, Kirby, & Deacon, 2010). A variety of strategies are used to support students' learning, to include (a) analyzing words for their constituent morphemes; (b) synthesizing meanings of individual morphemes to predict meanings of complex words; (c) producing morphologically complex words in cloze or analogy tasks; (d) engaging in problem solving to determine meaning of unknown morphologically complex words (Bowers, Kirby, & Deacon, 2010; Carlisle, 2010). In general, these reviews show positive and practically significant effects of morphological-based intervention on students' vocabulary knowledge. However, these reviews have not focused specifically on children with language learning difficulties.

The Clinical Question

Melinda's clinical question focused on whether students with language learning difficulties, who often experience delays acquiring inflectional morphology and who have difficulty learning new word meanings, would experience benefits from morphological-based intervention. In forming her clinical question, Melinda identified the target population broadly to reference students with language learning difficulties, knowing that many students who have an educational diagnosis of learning disability also have comorbid language impairment (as is the case for many students on her caseload). Melinda also sought to include morphological-based interventions that addressed morphological knowledge, awareness, and/or analysis. Melinda used the PICO (population, intervention, comparison, and outcome) format to propose her evidence-based question as follows: Do school-age children with language learning difficulties (P) who receive morphological-based intervention (I) show improvement in word knowledge (O) relative to a comparison intervention or control condition (C)?

Search for Evidence

To be included in this review, studies must (a) include school-age children with language learning difficulties; (b) describe a morphological-based intervention (i.e., targeting morphological knowledge, awareness, or analysis); and (c) measure word knowledge as an outcome. Studies were included for review if they (a) represented original research; (b) tested an intervention; (c) were published in a peer-reviewed journal; and (d) were reported in English. All research designs along the evidence hierarchy (e.g., case study, pre-post nonexperimental, randomized control trial) were included for consideration, and the duration of the intervention was free to vary.

ASHAWire, PsycINFO, Linguistics and Language Behavior Abstracts (LLBA), and ERIC databases were searched using the following terms: language AND morph* AND (intervention OR therapy OR treatment OR teaching OR instruction). (*Note:* The asterisk following morph is a search technique that allows for any word beginning with "morph," such as morpheme, morphology, morphological, etc.) Using these strategies, 891 possible citations were initially identified. The list was narrowed to 43 possible citations by excluding duplicate citations

and applying the inclusionary criteria presented above. The full texts of these 43 citations were reviewed to ensure that inclusionary criteria were met. A hand search of reference lists from these articles was also conducted to identify relevant citations that were not found through the online search. In total, five articles were identified for inclusion in this review and are summarized in Table 1.

Evaluating the Evidence

Summaries of Included Studies

The five studies included in this review covered a range of intervention content and strategies. First, in a single-subject experimental design, Fishley, Konrad, Hessler, and Keeseey (2012) tested an intervention that focused on teaching meanings of morphemes. Three female high school students (ages 15, 16, and 18) had educational diagnoses including specific learning disability with speech-language services, ADHD with speech-language services, and specific learning disability without speech-language services. The intervention included a graphic organizer and flash card procedure that was designed to improve morpheme fluency (i.e., providing quick and accurate definitions of morphemes). The acronym “GO FASTER” represented the following structure used to teach targeted morphemes: **g**raphic **o**rganizers; **f**lashcards **a**dded up and **s**elf-graphed to **t**rack progress; **e**rrors reviewed. The students were taught three individualized flashcard decks that each included 15 morphemes unknown to the students. Approximately one hour of instruction was provided per flashcard deck, totaling about 3 hours. The distribution of intervention across days/weeks and total length of intervention were not reported. Because of the study design, no statistical analysis was conducted. However, visual inspection of intervention data (i.e., number of correct morpheme definitions provided during 30-second timings) at baseline and during treatment showed that all students made improvement in their ability to state definitions of taught morphemes. Maintenance probes conducted at 2 to 3 and 4 to 6 weeks after intervention ended showed continued improvement or stabilization of morpheme definitions. Pre- and post-assessments measured generalization to 45 untaught words containing morphemes that were taught. Participants provided oral definitions and spelled these words. Visual inspection indicated all participants made improvements in their ability to define untaught words, though spelling was minimally affected.

Second, in a pre-post study, Katz and Carlisle (2009) tested an intervention targeting morphological analysis in a study with three female students in fourth grade who had language and reading difficulties. The students participated in 12 weeks of individual intervention for two 30-minute sessions per week. The first intervention module focused on morphological-analysis strategies, and the second focused on contextual analysis. Morphological-analysis activities included identifying prefixes and suffixes, using words’ structures to sort words into categories, and building complex words using prefixes, suffixes, and base words. Strategic reading behaviors were also modeled and encouraged by the researchers in each session. The effects of the intervention were determined through evaluating performance before and after intervention on standardized reading and language subtests and experimental measures, which included reading morphologically complex words, understanding the meanings of morphologically complex words, generalization of taught suffixes to untaught morphologically complex words, and reading fluency of passages containing morphologically complex words. In addition to gains on all experimental measures, all three students made gains on the standardized reading comprehension, listening comprehension, and oral vocabulary subtests. Their gains on oral vocabulary showed a moderate effect size. Additionally, one student made gains on the standardized picture vocabulary subtest with a large effect size.

Third, Wolter and Green (2013) tested an intervention targeting morphological analysis in a case study with an 8-year-old male with language and reading impairment. The intervention occurred during 1-hour sessions 5 days a week for 2 weeks, totaling 10 sessions. Therapy strategies of problem solving and self-discovery were incorporated with a detective theme. Activities included decoding complex words, sorting words to identify inflectional and derivational patterns, playing games that included the targeted patterns, completing word-building activities, and then linking the activities to reading. At posttest, conducted immediately after the intervention period, the student demonstrated improvement on standardized tests of receptive single-word vocabulary, reading comprehension, and segmenting nonwords, as well as improvement on experimental measures involving identification of the derivational relationship between word pairs that had sound or spelling changes (e.g., *steal* and *stolen*) and production of derivational words that had sound or spelling changes.

The fourth and fifth studies included in the corpus differed from the initial three in that they compared a morphological-based intervention to a comparison treatment. Wood, Mustian, and Cooke (2012) implemented a morphological-based intervention with eight seventh-grade students from low socioeconomic backgrounds. The students had diagnoses of specific learning disability, other health impairment, or emotional/behavioral disorder, and each of the students had Individualized Education Program goals for increasing vocabulary. The intervention used peer tutoring in a resource room, with each partner alternating within each session as tutor and tutee, and four words being taught in each role. (All students received three 15-minute training sessions in reciprocal peer tutoring prior to the study.) In this simultaneous treatment design, four morphologically complex words were taught using a whole-word method and four morphologically complex words were taught using a morpheme approach; these approaches were alternated and counterbalanced within each session. Four morphemes (two prefixes and two roots) were taught in total, with eight words taught per morpheme. The researchers created PowerPoint® slides that included the lesson content (i.e., instructions, words, example sentences, and audio clips). The slides for the whole-word approach guided students through several steps, including listening and repeating target words, listening to example sentences and making hypotheses about the words' meanings, and listening to and repeating the words' definitions. The slides for the morpheme approach guided students through steps that included listening to and repeating word parts, listening to words containing target morphemes, making hypotheses about the words' meanings, listening to sentences containing target morphemes and having students guess about the words' meanings, and then listening to and repeating the words' definitions. Vocabulary acquisition and vocabulary generalization were measured at the beginning of the study and after every two tutoring sessions using a forced-choice, sentence-cloze task in which a sentence was presented with a blank that could be filled by choosing the correct morphologically complex target word from four choices. Vocabulary acquisition measured students' performance with taught morphemes and words. Vocabulary generalization measured performance with taught morphemes in untaught words. Because of the study design, no statistical analyses were performed. Visual inspection of the data across time showed benefits of the morpheme approach. For vocabulary acquisition, seven students showed better performance in the morpheme

condition compared to the whole-word condition, whereas one student showed similar performance with the two conditions. For vocabulary generalization, performance was higher for all eight students in the morpheme condition.

Finally, Harris, Schumaker, and Deshler (2011) conducted an intervention study with ninth-grade students who comprised two groups: students with disabilities ($n = 24$) and students without disabilities ($n = 206$). Primary disability categories included learning disability, emotional disability, intellectual disability, other health impairment, and autism spectrum disorder. Students with disabilities were reported to perform below average on the vocabulary component of a standardized achievement test. Six English classrooms (taught by two teachers) were randomly assigned to a word-mapping (i.e., morphological-based) intervention or a vocabulary strategy. Three additional English classrooms (taught by a third teacher who did not consent to participate in the study) acted as the control; these students only completed the pretests and posttests. The researcher went into the classrooms and taught 10 lessons that were each 45 minutes long, totaling 7.5 hours. Twenty words were taught in total. The word-mapping strategy included the mnemonic MAPS and a graphic organizer to sequence the following steps: 1) breaking the words into morphemes, 2) attaching meaning to each morpheme, 3) predicting the meaning of the word, and 4) seeing if the prediction was correct by checking in a dictionary. The vocabulary strategy involved using imagery, key words, and a story to learn and remember taught words, with a graphic organizer to record each step. An assessment of strategy use before and after the intervention showed that students with and without disabilities in each experimental intervention learned to use their respective strategy, with large effect sizes. An open-ended word-knowledge task and a morphological-analysis task were given before and after the intervention. The word-knowledge test was given to measure students' learning of targeted words; students wrote any information they had about the word, used the word in a sentence, or provided a definition. The morphological-analysis task was given to measure students' generalization of morphemes that were taught in morphologically complex words that were not directly taught. The task required students to identify word parts, express the meaning of each word part, and predict the meaning of the entire word. Students with disabilities scored lower than typical students on both assessments but showed gains compared to their pretest performance. From pretest to posttest, students with and without disabilities in both treatment groups showed improvement in word

knowledge with large effect sizes. There was no significant difference between the two treatment groups on the word-knowledge task for students with or without disabilities; both treatments showed better word knowledge than the control group. Students with and without disabilities who received the word-mapping intervention showed better posttest performance on the morphological-analysis task, compared to students who received the vocabulary strategy and students who did not receive intervention.

Appraisal of Study Quality

Melinda used Dollaghan's Critical Appraisal of Treatment Evidence (Dollaghan, 2007) to help evaluate and organize the five studies that were included in the review. Melinda was most interested in study design, as study design (e.g., experimental, nonexperimental) is important for making causal inferences about the likelihood that the interventions affected children's morphological skills. Melinda noted that four of the five studies were case studies or single-subject studies (Fishley et al., 2012; Katz & Carlisle, 2009; Wolter & Green, 2013; Wood et al., 2012) and one was a classroom-based intervention (Harris et al., 2011). Harris and colleagues randomly assigned classes to the experimental and comparison interventions, and also included control classrooms, which were not randomly assigned. Thus, with the exception of Harris et al., the studies' designs fell on the lower end of the evidence hierarchy.

The Evidence-Based Decision

After reading through the studies and considering the quality of evidence, Melinda began to consider how she would answer her PICO question (i.e., whether a morphological-based intervention produced better word knowledge outcomes than an alternative or control condition in children with language learning difficulties). Four out of the five studies that she reviewed were individual or small-group intervention, similar to the service delivery model that she already uses. In this regard, the studies had good external validity. The classroom-based study (Harris et al., 2011) had the highest methodological quality in terms of design, but the participants had a broad range of disability diagnoses, making it difficult to apply directly to the individual students on her caseload. Three studies compared students to their baseline performance without a comparison intervention. These studies showed that children

learned the meanings of morphemes and generalized that knowledge to new words. The results of two studies (Katz & Carlisle, 2009; Wolter & Green, 2013) suggested that the morphological intervention resulted in clinically significant improvement in standardized measures of vocabulary. However, for the studies without a comparison intervention, it was not known whether the morphological intervention was better than a different approach, such as whole-word instruction. Two studies (Harris et al., 2011; Wood et al., 2012) compared a morphological intervention to a whole-word vocabulary intervention. Harris et al. found comparable word-knowledge gains with both interventions but better word-analysis performance with the morphological intervention. Wood et al. found better word knowledge and generalization in the morpheme condition.

Melinda began her review anticipating that she would find strong evidence supporting morphological-based intervention for students with language learning difficulties, considering the reviews she found for typically developing children. However, the evidence for using morphological-based intervention with students who have language learning difficulties was lower in number and quality, although the results of each study suggested that morphological-based intervention resulted in improved vocabulary knowledge and generalization of morphological knowledge to words that were not explicitly taught. Melinda reflected on the concerns that initially led her to conduct this search for evidence, which was that her students had a slow rate of learning new words, generalizing meanings to other contexts, producing words, and using words in grammatically correct ways. This complex array of difficulties was not addressed in the intervention studies that she reviewed, although several individual components were. Therefore, Melinda's evidence-based decision was to not replace her current vocabulary intervention protocol with a morphological-based intervention, but she would explore how to embed aspects of morphological instruction within her current vocabulary intervention program for students with language learning difficulties.

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Table 1. Summary of Included Studies

Citation	Type of Study	Participants	Intervention	Outcomes	Main Findings
Fishley, Konrad, Hessler, & Keesey (2012)	Case study	Three female students (15, 16, 18 years old). Educational diagnoses were specific learning disability with and without speech-language services and ADHD with speech-language services.	15-minute sessions, totaling about 3 hours.	All students improved their ability to state definitions of morphemes in immediate and maintenance probes. Spelling was minimally affected.	Positive results of intervention on morpheme knowledge and application to untaught words.
Harris, Schumaker, & Deshler (2011)	Randomized control trial	230 students in ninth grade. Students without disabilities ($n = 206$) and students with disabilities ($n = 24$), including learning disability, emotional disability, intellectual disability, other health impairment, and autism spectrum disorder.	Ten 45-minute lessons, totaling 7.5 hours.	All students receiving experimental instruction learned to use the strategy they were taught and showed improved word knowledge. Students who received the morphological intervention showed improved morphological analysis.	Positive results of whole-word and morphological interventions on word knowledge. Positive results of morphological intervention on morphological analysis.
Katz & Carlisle (2009)	Case study	Three female students, 9 years old, with language and reading difficulties but no educational diagnoses.	30-minute sessions, twice a week, for 12 weeks.	All three students made gains on passage comprehension, listening comprehension, and oral vocabulary on standardized, norm-referenced subtests. One student made gains on a picture vocabulary subtest. All three students made gains on experimental measures of reading and understanding morphologically complex words.	Positive results of a morphological intervention embedded within reading instruction on morpheme knowledge, vocabulary, and comprehension.
Wolter & Green (2013)	Case study	One 8-year-old male student with language and reading impairments.	1-hour sessions, 5 days a week, for 2 weeks.	Student showed improvement on standardized, norm-referenced tests of receptive single-word vocabulary, reading comprehension, and segmenting nonwords. He also showed improvement identifying relationships between roots and derivatives and producing words with derivational morphemes.	Positive results of intervention on morphological knowledge, vocabulary, reading comprehension, and phonological awareness.
Wood, Mustian, & Cooke (2012)	Single-subject, simultaneous-treatments design	Eight seventh-grade students (12 to 15 years old) from low socioeconomic backgrounds. Their educational disability diagnoses were specific learning disability, other health impairment, or emotional/behavioral disorder.	7-minute sessions, 2 days a week, for 14 weeks.	Seven students showed better performance in the morpheme condition for taught words. Performance on the generalization task was higher for all students in the morpheme condition.	Positive results of intervention on morpheme knowledge and application to untaught words.