Our presentation today will present a study . . .

. . . on how explicit attention to the morphemes of words can foster the reading achievement of Deaf/hard of hearing (D/HH) students.

First, some background . . .

Historically, D/HH students do not achieve the same level of reading achievement as their hearing peers (Spencer & Marschark, 2010). Cochlear implants have not closed the gap for students who are D/HH (e.g. Spencer & Marschark, 2010)

» the early linguistic gains of young CI users dissipated at higher grade levels and

» reading achievement continues to plateau around the fourth grade level when students reach the intermediate grades through high school years (Geers et al., 2007; Spencer & Marschark, 2010; Traxler, 2000)

Background . . .

Potential reasons for the plateau

> It is difficult for students who are D/HH to hear grammatically-accurate English, especially the audibly salient words (e.g. pronouns, articles, etc.) and bound morphemes of English. (Guo, Spencer, & Tomblin, 2013).

> As students move beyond primary-grade reading materials, the words get longer and the demands of vocabulary increase; such changes make comprehension more challenging (Carlisle, 2004; RAND Reading Study Group, 2002).

Background: Role of MA

Morphological awareness (MA):

» A student’s understanding that words are made up of meaningful units

that is, when a student takes a complex word apart to make sense of it and to uncover the relationship between this word and others.

Proficient readers do this automatically, which helps them learn more words and comprehend new information (Carlisle, 2004).

Background: Effect of MA

Ability to use the morphology of words:

> Expands students’ vocabulary and comprehension (e.g. Nagy, et al., 2008)

> Predicts reading achievement of English speakers (Nagy, Berninger, & Abbott, 2006), English Language Learners (Kieffer & Lesaux, 2008) and students who are D/HH (Gaustad, Kelly, Payne, and Lylak (2002; 2004).
Background: Effect of MA

Nagy et al.’s (2006) study with 4th/5th, 6th/7th, 8th/9th graders and the role of MA in decoding, spelling, vocabulary and reading comprehension reported:

MA made significant and unique contributions to:

» decoding rate of the eighth/ninth graders;
» vocabulary and spelling for all groups; and
» the reading comprehension of all groups, even "above and beyond that of reading vocabulary" (p. 134)

MA Studies: D/HH students

Only a few MA-related studies with D/HH students and most conducted with teens (Moore & Sweet, 1990) or college-aged students (Gaustad and colleagues)

Findings (Gaustad, et al., 2002; 2004)

> morphemic awareness is underdeveloped for many students, even those who have been in school for many years
> higher morphemic awareness corresponded to higher reading achievement.

Morphemes: Common in Text

Luetke (2013) analysis of basal stories (Harcourt, 2001)

> Grade 1 - 10 bound morphemes: dis-, -ed, -en, -ly, -ful, -ing, plural -s, possessive -s, third person -s, and -y
> Grade 3 - 21 additional: -able, -an, -ant, -en, -er, -ible, -ic, -ice, in-, -ion, -ious, -its, -ty, -ment, -mis, -or, -sion, -th, -tion, and -un
> Grade 5 – 9 additional bound morphemes, all derivational

Mayer (2007) concluded as she discussed the literacy abilities of deaf children, “it is not the presence of ASL but the absence of some form of face-to-face English that is at issue and the challenge for educators” (p. 416).

Access to Morphemes of English

Gaustad, Kelly, Payne & Lylak (2002) suggested SEE as a way to improve the “insufficient morphographic skills of deaf students” (p. 17)
Background: Potential of SEE

Signing Exact English (SEE) (Gustason & Zawolkow, 1993)

> A system of signing English designed so that the morphology of words is made visible to those who might not be able to hear them
> Includes signs to code audibly insalient English words (i.e., articles, pronouns, conjunctions) and bound morphemes (the difficulty substantiated empirically in Guo et al., 2013).
> Provides signs for root words and about 80 affixes (e.g., -al, -ity, -re, -ness, non-, etc.).
> Different signs exist for different bound morphemes in SEE, thus possible to sign, for example, derivations of the word “electric” (e.g., “electrical,” “electrician,” “electricity,” “ electrify,” and “nonelectrical”).

Purpose and Research Questions:

To investigate the English-language abilities and reading achievement of a sample of students who were D/HH and attended a school where staff and students communicated simultaneously in grammatically accurate Standard English via speech and Signing Exact English (SEE).

» Do the participants demonstrate Standard English-language proficiency as measured by informal and formal tests?
» Do the participants demonstrate reading achievement within the average range of their hearing peers?
» Are there significant correlations between the participants’ English-language and reading scores?
» Do participants’ scores on English-language measures predict reading achievement as measured on a standardized assessment of reading achievement?

Participants

17 students who are D/HH (8 boys, 9 girls) all attend school for the D/HH (PreK-8), in metro area northwest US (population of the school: 45 students Prek(age 3)-grade 8)
> 7-8 years (2nd grade) to 13-9 years (8th grade)
> Diversity among the participants
  + Racially: 11 Caucasian, 3 Asian, 3 biracial
  + Socio-economic status: Varied
  + Other background variables: family structure, factors related to the parents (level of education and signing with their child, and school involvement).

Data Collected on Students

Hearing and assistive device use (i.e., CIs, hearing aids)
  > Age of hearing loss, Unaided and aided hearing
  > Assistive listening device use
Speech – Photo Articulation Test (PAT-3; Lippke, Dickey, Selmar, & Soder, 1997)
  > 93 items, each describe a photo to prompt the use of a word with a target sound (initial, medial, or final position).
  > Normed on 3-8 yr. olds children with normal hearing so calculated a raw score (number of correctly pronounced phonemes out of the total possible articulation targets

Context

» School philosophy: All staff and students use grammatically accurate English, simultaneous speaking and signing English with SEE.
» English skills of all students & staff are regularly assessed.
» Goals and objectives set are based on age-appropriate skills.
» Reading curriculum (Harcourt, 2001)
» Assessment information is used to place students for daily reading instruction: 45 min small group, 15 minutes 1-to-1 tutoring - speech, vocab., grammatical constructions from the weekly basal selection, found to challenge the student in small group instruction.
Language
Structured and unstructured language samples
» Structured Photographic Expressive Language – SPELT
» Unstructured – collected in everyday classroom activities
» Clinical Evaluation of Language Fundamentals (CELF)
» Researcher-created morphemic awareness task (MA)

Reading - Gates-MacGinitie Reading Test (GMRT)
(MacGinitie, MacGinitie, Maria, & Dreyer, 2000)

Results: English Speech and Language

English Language Scores Within Grade Level Bands and Whole Group Averages

<table>
<thead>
<tr>
<th>PAT (speech articulation)</th>
<th>Grades 2-3 (n=4)</th>
<th>Grades 4-8 (n=13)</th>
<th>All Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>98% correct (range: 98-100)</td>
<td>91% correct (range: 91-93)</td>
<td>93% correct (range: 93-95)</td>
<td></td>
</tr>
<tr>
<td>SPELT (structured sample)</td>
<td>79.5</td>
<td>89.5</td>
<td>85.5</td>
</tr>
<tr>
<td>CELF-4 receptive</td>
<td>92.6</td>
<td>97.0</td>
<td>95.0</td>
</tr>
<tr>
<td>range: 75-95</td>
<td>range: 75-95</td>
<td>range: 75-95</td>
<td></td>
</tr>
<tr>
<td>CELF-4 expressive</td>
<td>96.3</td>
<td>91.6</td>
<td>94.6</td>
</tr>
<tr>
<td>range: 80-100</td>
<td>range: 80-100</td>
<td>range: 80-100</td>
<td></td>
</tr>
<tr>
<td>CELF-4 core</td>
<td>84.8</td>
<td>87.9</td>
<td>86.4</td>
</tr>
</tbody>
</table>

Note: Mean standard score for the CELF-4 is 100.

Results: Significant Correlations Between Language (SPELT, CELF) and Reading

Two-tailed Pearson correlations - **significant at .01 level - * significant at .05 level

<table>
<thead>
<tr>
<th>GMR Total</th>
<th>GMR Total</th>
<th>GMR Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAT (speech)</td>
<td>.316</td>
<td>-.312</td>
</tr>
<tr>
<td>SPERT (oral, sample)</td>
<td>.796**</td>
<td>.604*</td>
</tr>
<tr>
<td>Unstruct. sample</td>
<td>.660**</td>
<td>.514**</td>
</tr>
<tr>
<td>CELF-4 Receptive</td>
<td>.744**</td>
<td>.709**</td>
</tr>
<tr>
<td>CELF-4 Expressive</td>
<td>.855**</td>
<td>.840**</td>
</tr>
<tr>
<td>CELF-4 Core</td>
<td>.861**</td>
<td>.798**</td>
</tr>
</tbody>
</table>

Results: Reading Achievement (GMRT)

<table>
<thead>
<tr>
<th>Vocab. Mean (range)</th>
<th>Comp. Mean (range)</th>
<th>Total Mean (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grades 2-3 N=4</td>
<td>Grades 4-8 N=13</td>
<td>Total N=17</td>
</tr>
<tr>
<td>35 (29-48)</td>
<td>54 (24-77)</td>
<td>49 (24-77)</td>
</tr>
<tr>
<td>39 (32-55)</td>
<td>57 (27-81)</td>
<td>52 (27-81)</td>
</tr>
<tr>
<td>36 (28-52)</td>
<td>56 (26-80)</td>
<td>51 (26-80)</td>
</tr>
</tbody>
</table>

Discussion

» Receptive and expressive English language skills correlated to all reading achievement – not surprising (e.g. Catts, Hogan & Adlof, 2005; Moores & Sweet; 1990; Oakhill & Cain, 2012)
» As a group, the reading achievement of the students improved beyond the primary grades and was commensurate with hearing peers in contrast to the common finding that the gap between age and age-appropriate reading achievement widens as students who are D/HH get older (e.g. Mahoney et al., 2000; Spencer & Marschark, 2010)
Discussion

Potential Reasons For Students’ Achievement

» Continued achievement grades 4 and up: students know how to represent the morphology of words in everyday communication and can use MA to decode and understand multi-morphemic words in English (Carlisle, 2004).

» Lack of achievement – less proficiency in language, possibly due to limited access to sign support at home (Something we also studied.)

We realize . . .

» Small sample size

» Teachers’ sign-to-voice ratios calculated, but no guarantee they consistently used grammatically accurate English

» In many cases teachers collected the language samples and the CELF for IEPs and their results were not judged by a second rater.

» Researcher-created MA assessment – while highly correlated to the vocabulary component of the GMRT...

» Not subjected to reliability and validity measures

» In need of additional and more difficult items - ceiling effect

And conclude . . .

» The reading achievement of elementary and middle school students who are D/HH need not plateau and can be commensurate with that of hearing peers.

» Students who are D/HH need access to the morphology of English in order to decode the many and varied multisyllabic words in particularly prevalent content-area (math, science, social studies) reading materials in order to quickly process more and more advanced text.

» It is imperative that we in the profession examine the variables that may affect the achievement of students who are D/HH and advocate for changes in professional development and instructional practice in order for more students to reach their full potential as readers.

Questions

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