

Morphemic Awareness and Reading Comprehension When Students are Deaf or Have Hearing Impairments: An Exploratory Study

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Purpose:

To present a study that demonstrates how explicit attention to the morphemes of words (morphological awareness-MA), known to support the reading achievement of English speaking and second-language readers, can also support the reading achievement of students who are deaf or hard-of-hearing (D/HH).

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Background

Historically, students with a hearing loss 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)

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Background

Potential reasons for the plateau

- It is difficult for students who are D/HH to hear grammatically-accurate English, especially the audibly insalient 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).

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Background: Role of MA

Students with well-developed vocabularies:

- understand how language works and
- use grammatical clues to learn new words (RAND, 2002).

Morphological awareness (MA):

- A student's understanding that words are made up of meaningful units
- operationalized 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).

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Background: Effect of MA

Readers use the morphology of known words to unlock the meaning of multi-morphemic words while reading. Ability to use the morphology of words:

- expands students' vocabulary and comprehension (e.g. Nagy, et al., 2003)
- 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).

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Effect of MA (cont.)

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. Findings:

MA made significant and unique contributions to the

- 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)

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Background: MA development

Berninger, Abbott, Nagy, and Carlisle (2010) investigated the growth of phonological, orthographic, and morphological awareness from Grades 1-6. Using growth curve analysis, the authors found that

- word-level phonological and orthographic awareness - greatest growth during the primary grades but some additional growth afterwards
- morphological awareness shows greatest growth in the first three or four grades but one kind of MA - derivational— continues to show substantial growth grade 4

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MA Studies with the D/HH

Extant Literature: Few MA-related studies conducted with students who are D/HH 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.

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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, -ity, -ment, mis-, -or, re-, -sion, -th, -tion, and un-
- Grade 5 - 9 additional bound morphemes, all derivational

Difficulty for readers who are D/HH

- Difficult to hear (Easterbrooks, et al., 2008)
- No access unless finger spelled or signed during instructional and social conversations (Luetke, 2013)

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Importance of Instruction

Morphology "relates differently to reading and writing in different languages... Nonetheless across languages, the central role of morphemes in word formation and lexical processing constitutes an initial argument for the potential value of instruction in morphological awareness" (Carlisle, 2010, p. 485).

Explicit morphology instruction - Significant gains made by:

- Hearing students (see Carlisle, 2010 for review)
- ELLs (e.g. Lesaux, Kieffer, Faller, & Kelley, 2010)
- Students who are D/HH (Bow, Blamey, Paatsch, & Sarant, 2004)

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Access to morphemes of English

After all, 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).

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

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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-, un-, -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").

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Purpose and Research Questions:

The purpose of this study was to investigate the hypothesis that students' use of Signing Exact English (SEE) can support the development of MA, necessary for age-appropriate reading achievement. Questions:

1. Are there significant correlations between participants' English language skills and their reading achievement?
2. How does the reading achievement of the participants compare to their hearing peers on standardized measures of language proficiency and reading achievement?

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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;6 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).

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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.

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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)

Data Collected on Students (cont.)

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)

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Data collected on . . .

Student	Age	Unaided Hearing Loss	Aided PTA	Equip. (number of years with it)	CELF Core Lang.	CELF Recp. Lang.	CELF Exp. Lang.
1	7.6	Moderate to severe	43	HA (6)	78	86	77
2	8.11	Severe to profound	83	HA (6)	54	73	55
3	9.5	profound	10	CI (9)	64	76	71
4	9.5	profound	20	CI (6)	62	83	61
5	9.11	profound	20	HA (8)	112	116	110
6	10.7	severe	20	HA (6)	97	96	96
7	10.8	profound	20	CI (5)*	96	102	96
8	10.9	profound	13	CI (8)*	72	79	77
9	10.11	profound	75	HA (7)	94	90	101
10	11.2	profound	20	CI (10)	98	90	99
11	11.5	profound	27	CI (9)*	62	67	53
12	11.8	profound	20	CI (5)*	91	96	89
13	11.8	profound	20	CI (6)*	64	79	57
14	11.11	profound	13	CI (8)*	58	76	61
15	12.5	profound	15	CI (10)*	69	85	63
16	13.7	profound	10	CI (12)*	112	121	108
17	13.9	severe to profound	40.0	HA (12)	118	107	110

Results: English Speech and Language

English Language Scores Within Grade Level Bands and Whole Group Averages

	Grades 2-3 (n=4)	Grades 4-8 (n=13)	All Participants
PAT (speech articulation)	98% correct	91% correct	93% correct
SPELT (structured sample)	38% correct	76% correct	67% correct
CELF-4 receptive	79.5 range: 73-86	92.6 range: 67-121	89.5 range: 67-121
CELF-4 expressive	66.0 range: 55-77	86.1 range: 53-110	81.4 range: 53-110
CELF-4 core	64.5 range: 54-78	87.9 range: 58-118	82.4 range: 54-118

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

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

	GMRT Vocab	GMRT Comp	GMRT Total
PAT (speech)	-.316	-.354	-.312
SPELT (struct. sample)	.796**	.604*	.718**
Unstruct. sample	.860**	.784**	.854**
CELF-4 Receptive	.754**	.709*	.771**
CELF-4 Expressive	.855**	.849**	.882**
CELF-4 Core	.861**	.789**	.859**

Results: Reading Achievement (GMRT)

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

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.)

Discussion

“the morphological component of conversational competence in English is dependent on the mode and completeness of the models of English to which deaf students are exposed” (Gaufstad & Kelly, 2004, p. 283).

Explicit attention to morphemes via SEE in all aspects of the school day and the expectation that students use it.

- All staff at this school are explicit about the morphology of English through their use of SEE and they are given regular training and supervision to assess and maintain their skills (Mayer, 2013).
- All staff expect students to use grammatically accurate, standard English. When they do not, the teachers and other staff use the “Again” strategy (Appelman, Callahan, & Lowenbraun, 1980).

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Limitations

- 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

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Conclusions

- 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.

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TABLE 2
Aided hearing, CELF receptive standard score, grade/reading level, and reading assessment standard scores

Aided R.T.A.	Equip. (number of years with it)	CELF Recep. Lang.	Grade Level & GMRT Test Level	GMRT Vocab	GMRT Comp	GMRT Total	GMRT (Gr/Rea)	MA
43	HA (6)	86	2	29	32	28	1.9	12
83	HA (6)	73	3	34	34	33	2.6	36
10	CI (9)	76	3	48	55	52	3.9	31
20	CI (6)	83	3	29	35	32	2.5	18
20	HA (8)	116	4	72	75	75	8.6	40
20	HA (6)	96	4	51	42	46	4.3	38
20	CI (5)*	102	4	54	55	55	5.3	36
13	CI (8)*	79	4	42	51	46	4.3	34
75	HA (7)	90	5	58	68	62	7.4	37
20	CI (10)	90	5	77	81	80	12	37
27	CI (9)*	67	5	32	25	26	3.6	32
20	CI (5)*	98	5	67	68	67	8.4	39
20	CI (6)*	79	5	36	27	31	3.8	38
13	CI (8)*	76	6	24	52	38	5.4	34
15	CI (10)*	85	6	50	38	43	5.8	35
10	CI (12)*	121	8	66	75	74	13	40
40	HA (12)	107	8	71	77	80	13	40

Data collected on . . .

Results: Range and Mean Scores

Table 6
English-language proficiency and reading achievement (GMRT)

	Range of Scores	Mean (sd)
CELF Core Language	54-118	82.4 (21)
CELF-4 Receptive	67-121	89.5 (15.1)
CELF-4 Expressive	53-110	81.4 (20.8)
Morphology Assessment	12-40	33.9
GMRT Vocabulary	24-77	49.4 (17.1)
GMRT Comprehension	25-81	52.4 (18.9)
GMRT Total	26-80	51.1 (18.9)

Note: Mean standard score for the *Clinical Assessment of Language Fundamentals* (CELF-4) is 100. Mean standard score for the *Gates MacGinitie Reading Test* (GMRT) is 50.