Reading-related phonological processing interventions for individuals who use AAC: A systematic review

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CANDIDACY PROJECT

Research Questions

- What is the effect of instruction on the reading-related phonological processing skills of individuals who use Augmentative and Alternative Communication (AAC)?

- Which intervention methods are most effective?

- What intervention factors, if any, are associated with positive and negative outcomes?

How do Children Read?
Adam's Model
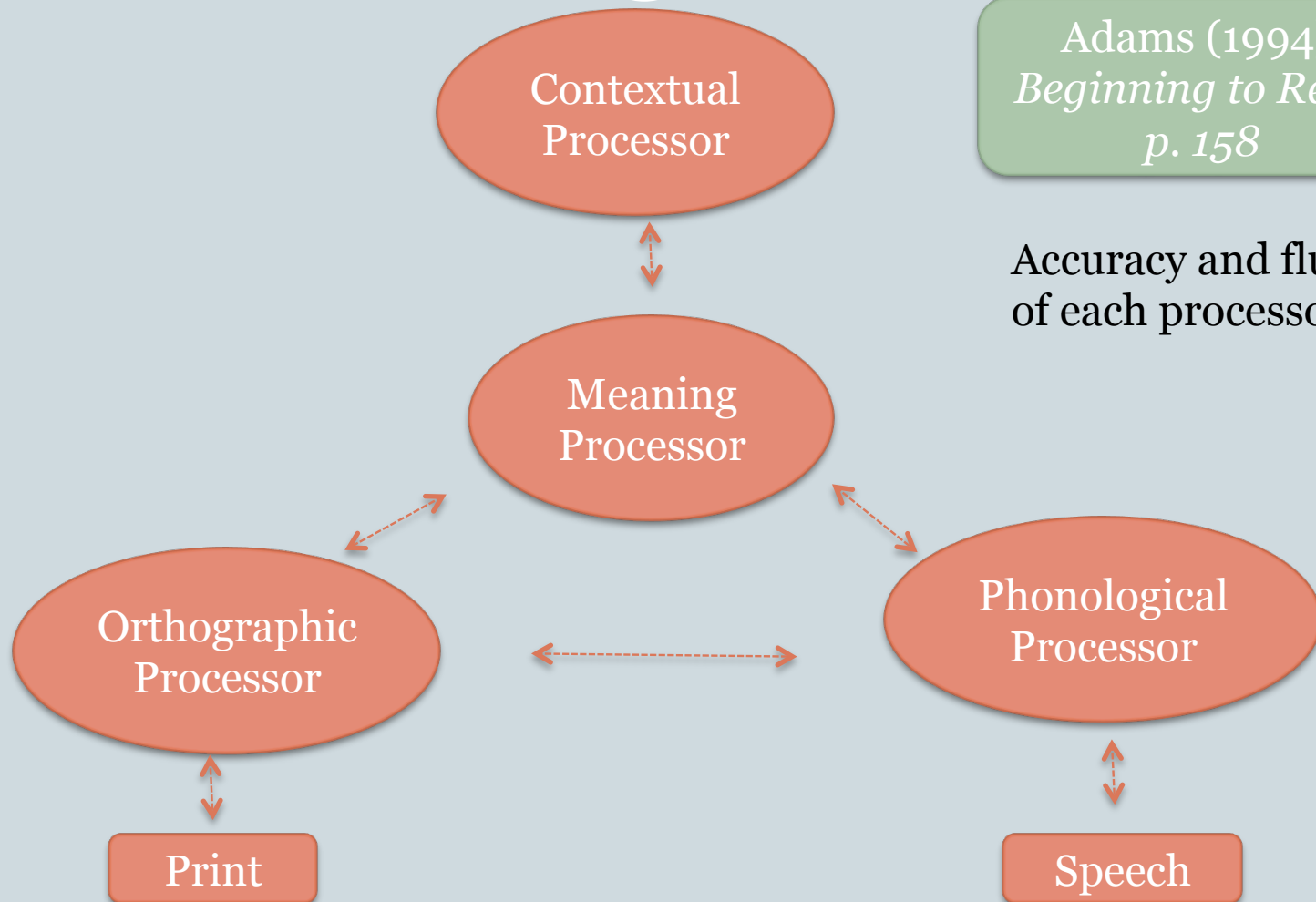
Contextual Processor

Adams (1994). *Beginning to Read, p. 158*

Accuracy and fluency of each processor

Meaning Processor

Orthographic Processor

Phonological Processor

Print

Speech

Factors Influencing Reading

Individual/ Intrinsic Variables	Literacy Skills	Environmental/ Extrinsic Factors
- Vision - Hearing - Motor Skills - Cognition - Language - Speech - World Knowledge - Motivation	- Phonological Awareness skills - Letter- Sound Correspondences - Decoding/ Encoding - Sight Word recognition or written production - Comprehension - Written expression	- Physical - Functional - Language - Social - Cultural - Instructional

Reading-Related Phonological Processing

- The ability to use the sound structure of language when learning to decode written language (Wagner, et al. 1994).
- Includes phonological awareness
  - Phoneme segmentation, blending, blending onset and rime, rhyming, phoneme counting, phoneme deletion.
- Letter-sound correspondences
- Single-word decoding

Inclusion Criteria

- Studies published between 1980-2012
  - Peer reviewed journals or dissertations
- English
- Provided intervention to improve reading-related phonological processing
  - Phonological awareness
  - Letter-sound correspondences
  - Single word decoding
- Involved individuals who use AAC (aided or unaided)

Exclusion Criteria

- Unpublished studies (e.g. studies presented at conferences), except for unpublished doctoral dissertations

- Involved individuals who's primary diagnosis was hearing loss

- Package treatments (e.g. taught listening comprehension, reading comprehension, sight words, and phonological awareness)

Search Procedures

Search Method	Search Terms	Yield	Warranted a detailed look
Database Searches	("Phonological Awareness or Phonemic Awareness" or "Decoding") AND ("Augmentative and Alternative Communication" or "AAC" or "Complex Communication Needs" or "Severe Speech"	797	40
Table of Contents	Same search terms Item-by-Item (4 journals) Expedited (40 journals)	3862	62
Ancestral		81	81
Author Searches	"Augmentative and Alternative Communication" and Author's name	311	5
Total		4970	188

Coding

- Design of the study
- Participants (Gender, age, disability)
- Independent Variable (Intervention)
- Dependent Variable
- Time
- Outcomes: PND and Gain Scores
- Certainty of Evidence (Conclusive, Preponderant, Suggestive, Inconclusive)
  - Simeonsson & Bailey, 1991
  - Horner et al., 2005

Results: Participants

- 36 Participants
  - 17 female, 15 male, 4 not specified
  - Ages 4-22
- Diagnosis
  - Down Syndrome (4)
  - Autism Spectrum Disorders (6)
  - Cerebral Palsy (17)
  - Severe Speech Impairment (3)
  - Multiple Disabilities NOS (1)
  - Brain Injury from a Stroke (1)
  - Mental Retardation (2)
  - Rare Disorders (2)
  - Cognitive delay or impairment: primary or secondary (13)

Direct or organized instruction approaches

- All conclusive studies utilized direct instruction or organized instruction

- Johnston et al (2009) taught sound-symbol correspondences using either a fixed (8 item) or gradual (1,2,4,6,8) array.

- Found that fixed array is more time-efficient.

Direct Instruction

- Model- Prompt- Check

- Model= Task Introduced and Modeled

- Prompt= Opportunity for guided practice: structured steps to guide the participant through the task (prompts)

- Check= Immediately performs the task independently

Direct instruction and Organized instruction approaches

- Direct Instruction (Fallon, et al., 2004; Light, et al., 2004)

- Organized Instruction: Nonverbal Reading Approach (Coleman-Martin, et al., 2005; Heller, et al., 2002; Swinehart-Jones & Heller, 2009)

- 94% of participants had PNDs of 96% (highly effective treatment) at teaching single word decoding

- Very similar approaches

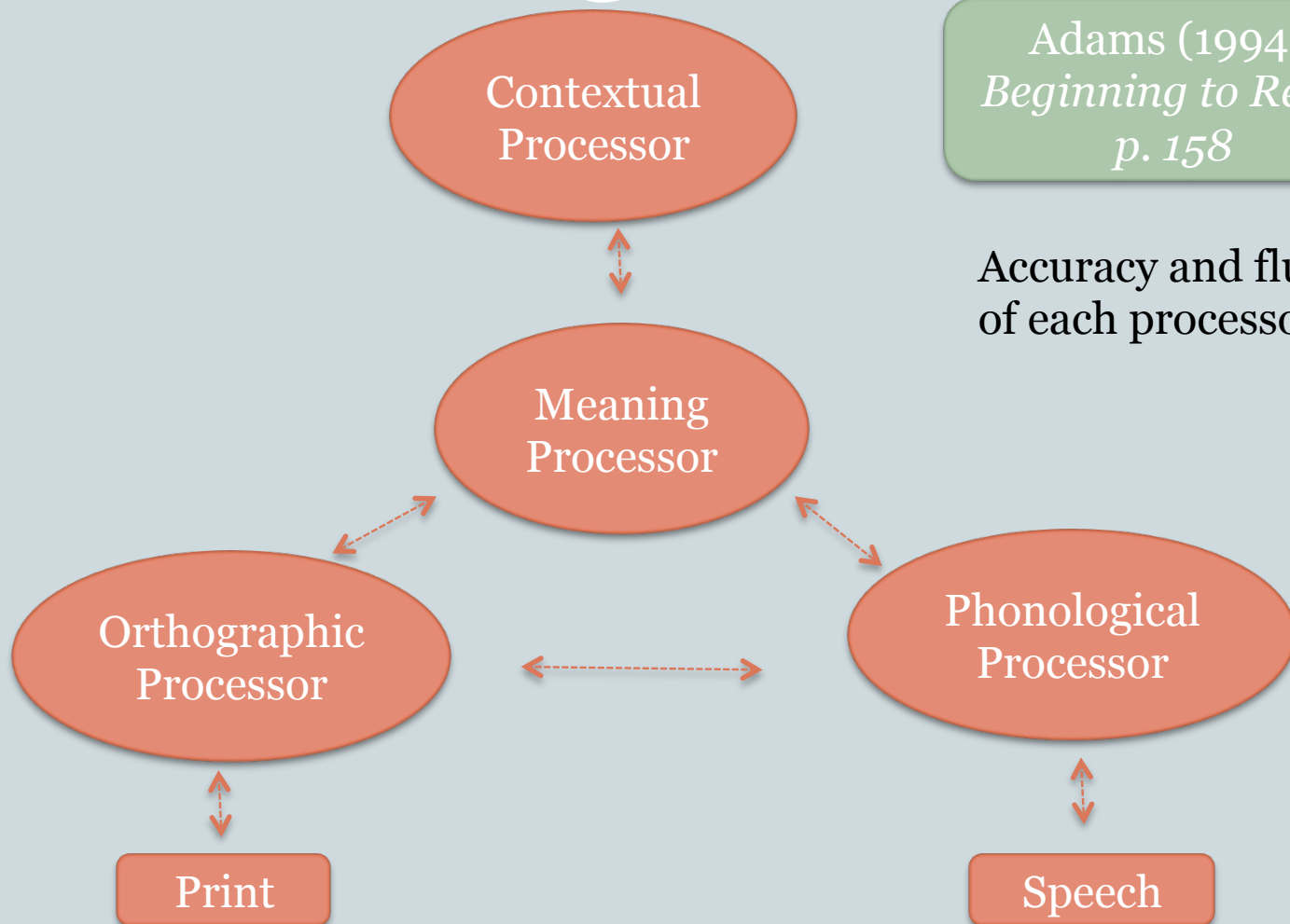# Comparison of direct and organized instruction approaches

	Direct Instruction **Fallon, et al. (2004) & Light et al. (2004)**	**Organized Instruction Nonverbal Reading Approach** **Coleman-Martin, et al. (2005), Heller, et al. (2002), Swinehart-Jones & Heller (2009)**
Letter-Sound Correspondences	Fallon et al. (2004): 50% required for inclusion. Taught remainder. Light et al. (2004): Taught them.	Required for inclusion.
Initial Phoneme Matching and Blending Skills	Taught via Direct Instruction as part of each intervention session prior to decoding instruction.	Included in decoding instruction only.

Direct instruction approaches: Decoding Steps

	Direct Instruction	Nonverbal Reading Approach
Introduction	Yes	Yes
Modeled Task	Yes	No
Guided Practice: Produced each phoneme and modeled blending	Yes- All letters visible, tracked with finger	Yes- Covered letters and revealed one at a time. Emphasized "Say it in your head"
Checked for Accuracy	Yes, Immediately	No
Evaluation	Match written word to picture (f=4)	Read written word. Identify a spoken word from 4 choices.

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Storybook Methods for teaching phonological awareness

- Banajee (2007) evaluated two different types of phoneme-loaded books
  - Alphabet Stories: emphasize a given letter
  - Phonic Faces: each page itself provides written symbol for the target letter (as part of the picture) and information re: how to produce the sound. Instructor pointed at letter while producing the phoneme.

  - Phonic Faces (highly effective). Alphabet stories (questionably effective).
- Often included with other instruction (direct, organized, or discovery learning teaching)

Combination Approaches

- Bailey, Angel, & Stoner (2011)
  - Suggestive
  - Phoneme-loaded books + discovery learning instruction
  - 10 different PA tasks
  - Unreliable to questionably effective

- Blischak (1999) Group study
  - Combination of stories + discovery learning instruction
  - Stories, games, poems
  - No significant improvement in rhyming skills
  - Synthetic Speech Group: Varied improvements in verbal speech (-31% to +57% change in % of natural speech used, mean of +23%)

Overall

- Still very little evidence
- Direct and Organized instruction approaches
  - Conclusive evidence: Highly effective
- Storybook methods
  - Phoneme-loaded books are questionably effective
  - Phoneme-loaded books that specifically teach sound-symbol correspondences in the text itself (ex. Phonic Faces) may be effective
- Combination approaches
  - Unreliable to questionably effective
  - No significant improvement

Future Directions

- Studies involved only 36 individuals
  - Cerebral Palsy (17), ASD (6), Down Syndrome (4), Severe Speech Impairment (3), Multiple Disabilities NOS (1), Brain Injury from a stroke (1), Mental Retardation (2), Rare disorders (2), Cognitive impairment as a primary or secondary deficit (13), Legally blind as a secondary diagnosis (1)
  - Replication within and across these groups is needed for further generalizability

- Group studies

- Comparative studies: direct instruction approaches

- Comparative studies: direct/ organized phonological processing instruction vs sight words instruction

- Expand to a wider range of individuals with MR (both those who use AAC and those who do not)

References

- Adams, M. J. (1994). Beginning to read. Massachusetts: Massachusetts Institute of Technology.
- Bailey, R. L., Angell, M. E., & Stoner, J. B. (2011). Improving Literacy Skills in Students with Complex Communication Needs Who Use Augmentative/Alternative Communication Systems. Education and Training in Autism and Developmental Disabilities, 46(3), 352–368.
- Banajee, M. H. (2008). Effect of adapted phonic faces story books on phonological skills of children with severe expressive language disorders. Dissertation Abstracts International Section A: Humanities and Social Sciences, 68(7-A), 2857.
- Coleman-Martin, M. B., Heller, K. W., Cihak, D. F., & Irvine, K. L. (2005). Using Computer-Assisted Instruction and the Nonverbal Reading Approach to Teach Word Identification. Focus on Autism and Other Developmental Disabilities, 20(2), 80–90.
- Fallon, K. A., Light, J., McNaughton, D., Drager, K., & Hammer, C. (2004). The Effects of Direct Instruction on the Single-Word Reading Skills of Children Who Require Augmentative and Alternative Communication. Journal of Speech, Language, and Hearing Research, 47(6), 1424–39.
- Heller, K. W., Fredrick, L. D., Tumlin, J., & Brineman, D. G. (2002). Teaching Decoding for Generalization Using the Nonverbal Reading Approach. Journal of Developmental and Physical Disabilities, 14(1), 19–35. doi:10.1023/A: 1013559612238
- Johnston, S. S., Buchanan, S., & Davenport, L. (2009). Comparison of Fixed and Gradual Array When Teaching Sound-Letter Correspondence to Two Children with Autism who Use AAC. Augmentative and Alternative Communication, 25(2), 136–144. doi:10.1080/07434610902921516
- Light, J., McNaughton, D., Weyer, M., & Karg, L. (2008). Evidence-Based Literacy Instruction for Individuals Who Require Augmentative and Alternative Communication: A Case Study of a Student with Multiple Disabilities. Seminars in Speech and Language, 29(02), 120–132. doi:10.1055/s-2008-1079126
- Swinehart-Jones, D., & Heller, K. W. (2009). Teaching Students With Severe Speech and Physical Impairments a Decoding Strategy Using Internal Speech and Motoric Indicators. The Journal of Special Education, 43(3), 131–144.
- Truxler, J. E., & O'Keefe, B. M. (2007). The effects of phonological awareness instruction on beginning word recognition and spelling. Augmentative and Alternative Communication, 23(2), 164–176. doi: 10.1080/07434610601151803