

*Table 1. Articulatory Kinematic Approaches to AOS Intervention and Specific Strategies*

| Author(s)<br>& year                  | Immediate<br>repetition | Delayed<br>repetition | Phonetic/<br>Articulatory<br>placement | Phonetic/<br>Articulatory<br>placement<br>diagrams | Graphemic/<br>Orthographic<br>cues | Models/<br>Imitation/<br>Integral<br>stimulation | Unison<br>production | Reading<br>aloud | Answering<br>questions | Additional<br>self-practice/<br>Auditory<br>models from<br>AAC device | Verbal<br>feedback |
|--------------------------------------|-------------------------|-----------------------|--|--|------------------------------------|--|----------------------|------------------|------------------------|---|--------------------|
| 8-step task continuum                |                         |                       |  |  |                                    |  |                      |                  |                        |   |                    |
| Aitken Dunham<br>(2010)              | X                       | X                     |  |  |                                    | X  |                      |                  |                        |   |                    |
| Motor Learning Guided (MLG) approach |                         |                       |  |  |                                    |  |                      |                  |                        |   |                    |
| Friedman et al.<br>(2010)            | X                       |                       |  |  |                                    | X  | X                    | X                | X                      | X   |                    |
| Lasker et al.<br>(2008)              | X                       | X                     |  |  |                                    |  |                      | X                |                        | X   | X                  |
| Lasker et al.<br>(2010)              | X                       | X                     |  |  |                                    |  |                      | X                |                        | X   | X                  |
| Phonologic placement treatment       |                         |                       |  |  |                                    |  |                      |                  |                        |   |                    |
| Savage et al.<br>(2012)              |                         |                       | X                                      | X  |                                    |  |                      |                  |                        | X   |                    |
| Speech Motor Learning (SML) Program  |                         |                       |  |  |                                    |  |                      |                  |                        |   |                    |
| van der Merwe<br>(2007)              |                         |                       |  |  | X                                  | X  |                      |                  |                        |   | X                  |
| van der Merwe<br>(2011)              |                         |                       |  |  | X                                  | X  |                      |                  |                        |   | X                  |
| Sound Production Treatment (SPT)     |                         |                       |  |  |                                    |  |                      |                  |                        |   |                    |
| Wambaugh<br>(2004)                   | X                       |                       | X                                      |  |                                    | X  |                      |                  |                        |   | X                  |
| Wambaugh &<br>Nessler (2004)         | X                       |                       | X                                      |  | X                                  | X  | X                    |                  |                        |   | X                  |
| Wambaugh<br>& Mauszycki<br>(2010)    | X                       |                       | X                                      |  | X                                  | X  | X                    |                  |                        |   | X                  |
| Repeated practice                    |                         |                       |  |  |                                    |  |                      |                  |                        |   |                    |
| Wambaugh et al.<br>(2012)            | X                       |                       |  |  |                                    | X  |                      |                  |                        |   | X                  |
| Script training                      |                         |                       |  |  |                                    |  |                      |                  |                        |   |                    |
| Youmans et al.<br>(2011a)            |                         |                       |  |  | X                                  | X  | X                    | X                |                        |   |                    |
| Youmans et al.<br>(2011b)            |                         |                       |  |  | X                                  | X  | X                    | X                |                        |   |                    |

**Table 2. Summary of Articulatory Kinematic Studies**

| Author(s)<br>(year)       | Number of<br>participants | AOS severity<br>& aphasia   | Targets/Dependent<br>variables  | Treatment<br>description   | Outcomes  |
|---------------------------|---------------------------|---|---|--|---|
| Aitken Dunham<br>(2010)   | 2                         | Both mild–<br>moderate AOS<br>With aphasia                                      | Words   | 8-step task continuum—<br>integral stimulation;<br>delayed production;<br>successive productions   | 2/2 participants<br>demonstrated<br>improvement for<br>producing words  |
| Friedman et al.<br>(2010) | 1                         | Moderate–severe<br>AOS<br>No mention of<br>aphasia                              | Functional phrases  | Motor Learning Guided<br>(modified)—unison<br>production with<br>clinician, repetition,<br>delayed repetition,<br>clinician models,<br>orthographic cues,<br>fading cues | Accuracy increased for<br>trained targets. Scores<br>decreased after 1 to 2<br>weeks, but remained<br>higher than baseline.               |
| Lasker et al.<br>(2008)   | 1                         | Severe–profound<br>AOS<br>With aphasia  | CV words<br>Two-syllable words/<br>phrases                                    | Motor Learning<br>Guided—clinician<br>model, immediate<br>repetition, imposed<br>delay between each<br>attempt, independent<br>production                                | Acquired and used<br>treatment targets  |
| Lasker et al.<br>(2010)   | 1                         | Severe AOS<br>With aphasia  | 4 to 11 syllable<br>phrases   | Motor Learning<br>Guided—clinician<br>model, immediate<br>repetition, imposed<br>delay between each<br>attempt, independent<br>production                                | Improvements for<br>trained stimulus items  |
| Savage et al.<br>(2012)   | 1                         | Severe AOS<br>No reported aphasia   | Sounds in words   | Phonologic placement<br>treatment—drawings<br>or photographs for<br>phonological support,<br>tactile cues, auditory<br>input   | Improved production of<br>sounds in words   |
| van der Merwe<br>(2007)   | 1                         | AOS severity not<br>reported<br>Without aphasia                                 | Words   | Speech Motor Learning<br>Program—see van der<br>Merwe (2011)   | Decrease in incorrect<br>productions and increase<br>in self-corrections for<br>words   |
| van der Merwe<br>(2011)   | 1                         | Moderate AOS—<br>spoke in 4- to<br>5-word phrases/<br>sentences<br>With aphasia | Words   | Speech Motor Learning<br>Program—hierarchy of<br>steps and stimuli from<br>simple to complex—<br>imitation, orthographic<br>cues, integral stimulation                   | Improvements for the<br>production of words,<br>but loss of experimental<br>control. Unknown if<br>improvements were due<br>to treatment. |
| Wambaugh<br>(2004)        | 2                         | Moderate–severe<br>AOS<br>With aphasia<br>Mild–moderate<br>AOS<br>With aphasia  | Phrases of 2 words<br>One participant:<br>/r/ blends in<br>monosyllabic words | Sound Production<br>Treatment—minimal<br>pair contrasting,<br>repetition, modeling,<br>articulatory placement<br>cues, verbal feedback                                   | Increased accuracy for<br>sounds treated  |

**Table 2. Summary of Articulatory Kinematic Studies (continued)**

| Author(s)<br>(year)               | Number of<br>participants | AOS severity<br>& aphasia  | Targets/Dependent<br>variables                         | Treatment<br>description   | Outcomes   |
|-----------------------------------|---------------------------|--|--|--|--|
| Wambaugh &<br>Nessler (2004)      | 1                         | Moderate–severe<br>AOS<br>With aphasia                                     | Specific sounds in<br>monosyllabic words               | Sound Production<br>Treatment—minimal<br>pair contrasting,<br>repetition, modeling,<br>articulatory placement<br>cues, verbal feedback,<br>integral stimulation,<br>visual cues, graphemic<br>cues | Improved production<br>of sounds in words.<br>Improved production<br>maintained for some<br>sounds.  |
| Wambaugh &<br>Mauszycki<br>(2010) | 1                         | Severe AOS<br>With aphasia   | Sounds in CV or<br>CVC words                           | Sound Production<br>Treatment—minimal<br>pair contrasting,<br>repetition, modeling,<br>articulatory placement<br>cues, verbal feedback,<br>integral stimulation,<br>visual cues, graphemic<br>cues | Improved production<br>of trained words;<br>generalization to<br>untrained examples<br>of trained sounds;<br>maintenance at 10 weeks                             |
| Wambaugh<br>et al. (2012)         | 10                        | AOS, but no<br>reported severity<br>With aphasia                           | Sounds in words  | Repeated practice after<br>a model.<br><br>Repeated practice with<br>rate rhythm control.  | Improvements with<br>repeated practice.<br><br>Limited affects with the<br>addition of rate/rhythm<br>approach.  |
| Youmans et al.<br>(2011a; 2011b)  | 3                         | (1) Mild–moderate<br>AOS<br>(2, 3) Moderate–<br>severe AOS<br>With aphasia | Scripts personalized<br>to the specific<br>participant | Script training—<br>clinician models, unison<br>productions of phrases,<br>fading cues during<br>unison productions,<br>orthographic cues, and<br>independent productions                          | Increased the number of<br>correct words produced<br>in each of three scripts.<br>Participants reported<br>using the scripts<br>and demonstrated<br>maintenance. |