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The treatment of apraxia of speech

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Chapter 3

Treatment of Apraxia of Speech



 Speech and
Music Therapy,
an Innovative
Joint Effort



7

3.1 | History and definition

In clinical practice, a variety of behavioural methods is used to treat patients with AoS. Wambaugh, Duffy, McNeill, Robin, & Rogers (2006b) identified five general categories of AoS treatments: (1) articulatory-kinematic approaches, (2) rate-rhythm control, (3) alternative-augmentative communication, (4) intersystemic facilitation/reorganisation, and (5) others. This chapter describes articulatory-kinematic and rate-rhythm control strategies because the rationales of these approaches are based on the processes of speech motor programming and planning, as described in the previous two chapters. First, general principles of motor learning are described as the fundamentals of AoS treatment.

3.2 | Motor learning in the treatment of Apraxia of Speech

Maas, Robin, Austermann Hula, Freedman, Wulf, Ballard and Schmidt (2008) described the application of the principles of motor learning in the treatment of motor speech disorders. Many methods aim to establish new motor routines or re-establish old ones, thus involving motor learning. Figure 3.1 represents this basic idea.

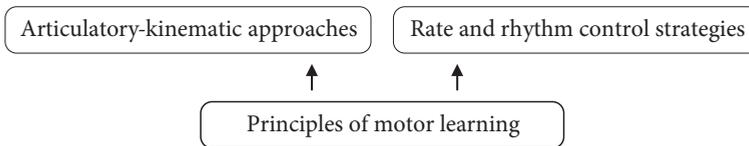


Figure 3.1 | Principles of motor learning in relation to AoS treatment

Motor learning refers to processes that provide the ability to re-organise the execution of a movement (Schmidt & Lee, 2005). Principles of motor learning have emerged from studies involving non-speech motor tasks, such as throwing a ball by participants with intact motor systems. However, the relation between motor control of non-speech movements and speech is unclear (Duffy, 2007). Therefore, the transfer of information about motor learning in general to speech motor control,

and, moreover, to patients with brain damage, is in a premature stage. Maas et al. (2008) reviewed the literature in which principles of motor learning were extended to the treatment of speech motor control. Maas et al. (2008) found no evidence for practice amount (i.e., number of sessions), practice distribution (i.e., length of the treatment in a period of time) or attentional focus (i.e., concentration on various components and effects of a movement). Furthermore, they showed limited evidence for practice variability (i.e., constant and variable practice), practice schedule (i.e., random and blocked practice) and target complexity (i.e., simple versus complex target items). The results of this tutorial suggest that principles of motor learning hold promise for AoS treatment, but, again, this is in a premature stage.

Therapies that rehearse isolated sounds or syllables in regular rhythmical strings have been criticised in AoS treatment literature and articulatory movements should assemble to functional goals: meaningful words (Miller & Docherty, 1995). However, traditional therapies usually start with isolated sounds, and then move on to two sounds and so on. These therapies run the risk of losing the dynamic nature of motor control as described in Chapter 1. Instead, patients should practice articulatory gestures and gestural movements and gradually differentiate them. Generally, there may be two ways to improve the process of speech motor control. *Articulatory-kinematic approaches* focus on spatial aspects of segmental accuracy. Details of the disturbed segments are differentiated with regard to the articulatory levels, such as lips, velum and glottis, to change the target word into accurate speech production. Alternatively, therapies using *rate and rhythm control strategies* prefer a different approach. Here, the emphasis is on the dynamics of articulation and the temporal and rhythmical aspects of fluent speech. Prosodic aspects, such as the flow and melody of speech, are exaggerated to improve intelligible speech production (Miller, 2000). Figure 3.2 shows how these different approaches relate to the model of speech motor control. The next section describes both techniques.

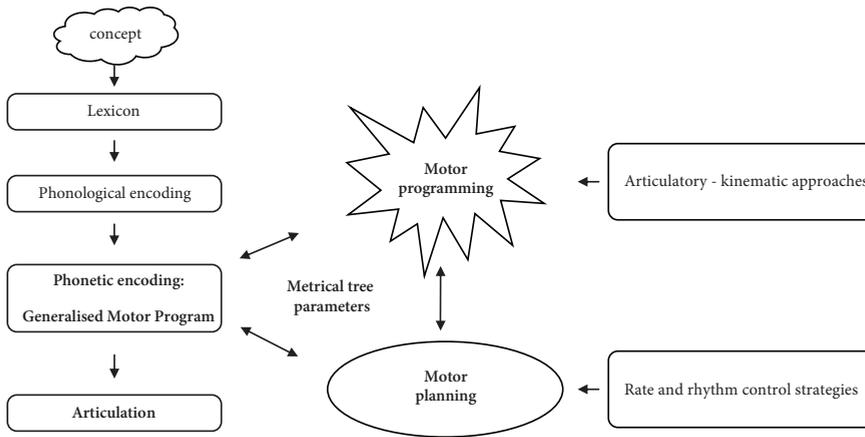


Figure 3.2 | Techniques of AoS treatment in relation to the disturbed process of speech motor control

3.3 | Articulatory-kinematic approaches

The authors of treatments using the articulatory-kinematic approach focus on improvement of spatial and temporal aspects of speech production (Wambaugh et al., 2006b). Rosenbek, Lemme, Ahern, Harris and Wertz (1973) emphasise that AoS articulatory-kinematic treatment should concentrate on the impairments in accuracy (i.e., phonetic distortions and phonemic paraphasias). Therefore, treatments in this category are related to the level of speech motor programming. Various tasks may be used, such as reading aloud, naming and repeating phonemes, syllables, words and sentences. The therapist assists the AoS patient to explain how a phoneme should be articulated. For example, when an AoS patient experiences difficulty producing the phoneme /b/, the therapist concentrates on opening and closing of the lips. This exercise can be followed by building up oral pressure, and finally adding sound by activation of the vocal cords.

The treatments target segmental accuracy, by using techniques such as phonetic derivation, progressive approximation, phonetic placement, the use of phonetic contrasts, increasing awareness of spatial dimensions of speech movements and improvements in the accuracy of articu-

lation by modifying the production of phonemes, syllables or words (Rosenbek, 1985; Wertz et al., 1984; Square-Storer, 1989). Wambaugh, Duffy, McNeill, Robin and Rogers (2006a) described articulatory-kinematic treatment guidelines. Also, they performed the first systematic review in the area of AoS treatment (Wambaugh et al. (2006b). They concluded that AoS patients improve their speech production as a result of treatment, even in chronic stages. However, the quantity and quality of the evidence was limited (Wambaugh et al., 2006b; Wambaugh & Shuster, 2008). The results of a recent systematic review of AoS treatment literature between 2004 through 2012 nevertheless supported positive effects of articulatory-kinematic techniques (Ballard, Wambaugh, Duffy, Layfield, Maas, Mauszycki, & McNeil, 2013).

3.4 | Rate and rhythm control strategies

The underlying premise of a treatment focussing on rate and rhythm is that AoS is characterised by disruptions in speech production timing (Wambaugh et al., 2006b). These treatments concentrate on prosodic aspects of speech production, such as stress, tempo and intonation (Brendel, Ziegler, & Deger, 2000). The same tasks can be used as in the articulatory-kinematic approaches (i.e., reading aloud, naming and repeating), but the techniques are more ‘dynamic’ in nature. Therefore, treatments in this category are related to motor planning, including timing and force parameters of Schmidt’s (2003) Schema Theory and the dynamic nonlinear approach of speech motor control, such as Ziegler’s (2009) gestures theory (see Chapter 1).

Various techniques are used in the rate and rhythm control strategy. Reducing speech rate, for example, to improve intelligibility is a frequently used technique in clinical practice (e.g., Southwood, 1987). Speech rate is then used as a compensatory mechanism: it is a way in which speech production is modified to cope with the speech motor programming deficit. However, therapies using melody and rhythm, such as Melodic Intonation Therapy (MIT; Albert, Sparks, & Helm,

1973; Sparks, Helm, & Albert, 1974) or music therapy, such as Speech-Music Therapy for Aphasia (SMTA; De Bruijn, Zielman, & Hurkmans, 2005), target to improve task-specific coordinative processes. Therefore, these techniques cannot be considered to be aiming at compensatory mechanisms. Moreover, the aim is to improve speech motor control by restoring function rather than creating a compensation mechanism.

Examples of rhythm-based treatment methods are contrastive stress drill, finger tapping or counting, the use of a pacing board or metronome, and metrical pacing (Wertz, et al. 1984; Dworkin, Abkarian, & Johns, 1988; Square, Martin, & Bose, 2001; Brendel & Ziegler, 2008; Mauszycki & Wambaugh, 2011). Techniques that resemble melodic-speech therapies include singing and control of speech rate by encouraging prolonged speech production (Southwood, 1987; Keith & Aronson, 1975; Wambaugh & Martinez, 2000).

Efficacy studies in the rate and rhythm control strategy are scarce and the methodological quality of the studies is low. Therefore, no firm conclusions can yet be drawn with regard to the effect of rate and rhythm control therapies. However, studies claim some techniques to be successful according to case and case-series reports. Brendel and Ziegler (2008), for example, evaluated the effect of a Metrical Pacing Technique (MPT), a rather novel treatment of AoS based on rhythmic stimulation. MPT was applied to ten patients with AoS in a crossover design, including control of treatment. Brendel and Ziegler (2008) observed that the patients were more fluent, faster, and more accurate in the production of a set of untrained test sentences after MPT compared to the control treatment (i.e., a combination of traditional word and sentence based treatments, such as phonetic placement, gestural facilitation and integral stimulation). Overall treatment effects were also seen in diadochokinesis (i.e., rapid syllable repetitions), word and non-word repetition and in conversation. The results exceeded the effects of spontaneous recovery.

The most common treatment using melody and rhythm in the rate and rhythm control strategy is MIT (Albert et al., 1973; Sparks et al., 1974) and this program has been used most frequently in efficacy studies. Therefore, the next paragraph will deal with MIT in more detail.

3.5 | Melodic Intonation Therapy (MIT)

Melodic Intonation Therapy (MIT; Albert, et al., 1973; Sparks, et al., 1974, Helm-Estabrooks, Nicholas, & Morgan, 1989; Helm-Estabrooks & Albert, 2004; Sparks, 2008) is a hierarchically-structured therapy using three main components: melodic intonation, rhythmic speech and the use of common phrases (so called ‘formulaic speech’). Both the melodic and the rhythmic structures are restricted to two notes (high and low) and two durations (long and short). Further, MIT focusses on three prosodic aspects of articulation. The first aspect is the *melodic line* (i.e., variations in pitch). The second aspect is *tempo* (i.e., reduction of speech rate). The final prosodic aspect is *rhythm* and stress. These aspects are exaggerated in MIT. The original program prescribes a procedure of five steps. In the first step the therapist introduces a simple 2 to 3 syllabic utterance (e.g., “I love you”) by showing a visual cue (e.g., a written word or a gesture) and humming the target phrase. During this first step no verbal response is required from the patient. In the following step the therapist presents the target utterance in so-called ‘Sprechgesang’. An example of an MIT utterance is presented in Figure 3.3. The melodic contour is determined by the natural-speech prosody. Stressed syllables are sung on the higher of the two pitches. The patient joins the therapist in unison, intoning (i.e., singing) the target utterance while the therapist taps the patient’s left hand (one time per syllable). During the next step, the therapist fades out while the patient continues to sing without the support of either oral or facial cueing. The subsequent step is a repetition phase. The therapist intones (by humming) and taps the target utterance. The patient immediately repeats with a verbal response, assisted by tapping of the left hand. In the final step, the patient responds to a probe question.

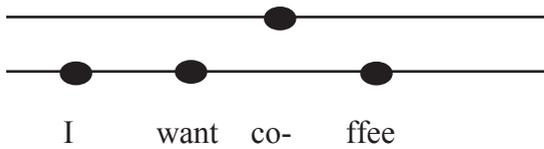


Figure 3.3 | Example of a MIT utterance

MIT is used worldwide. However, many interpretations of the original protocol have been described (see for review Zumbansen, Peretz, & Hébert, 2014a). Furthermore, modifications to the MIT protocol have been developed, especially by including elements from music therapy (for example, the Modified MIT; Baker, 2000). Also, new programmes that fit within the rate and rhythm control strategies were developed focussing on the role of music in therapy, such as SMTA. Various issues related to music, including music therapy, will be discussed in the following chapter.

