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<u>An exploration of Broca's Aphasia, Melodic Intonation Therapy and its use as a strategy in practice</u>

Within this paper I will briefly explore speech production and how it can be affected following acquired brain injury (ABI), critically evaluate 'Broca's Aphasia' and a tool used to aid speech recovery called melodic intonation therapy (MIT) and consider if and how I might adapt MIT for use within my practice as a community musician working with adults with acquired brain injury. Finally, I will critically reflect on what I have learnt and consider how this newly acquired knowledge has informed my practice.

Speech Production

"Speech production is a highly complex motor act involving respiratory, laryngeal, and supraglottal vocal tract articulators working together in a highly coordinated fashion" (Kearney & Guenther, 2019, p. 1214). In other words, the production of speech is an intricate process utilising numerous anatomical and physiological elements involving the respiratory system, which includes the nasal cavity, trachea and lungs for breath, the larynx for speech production, the vocal tract ie. throat and mouth, and articulators which includes the vocal folds, jaw, lips, teeth, and tongue (Docio-Fernandez & Mateo, 2015) (see Figure 1).

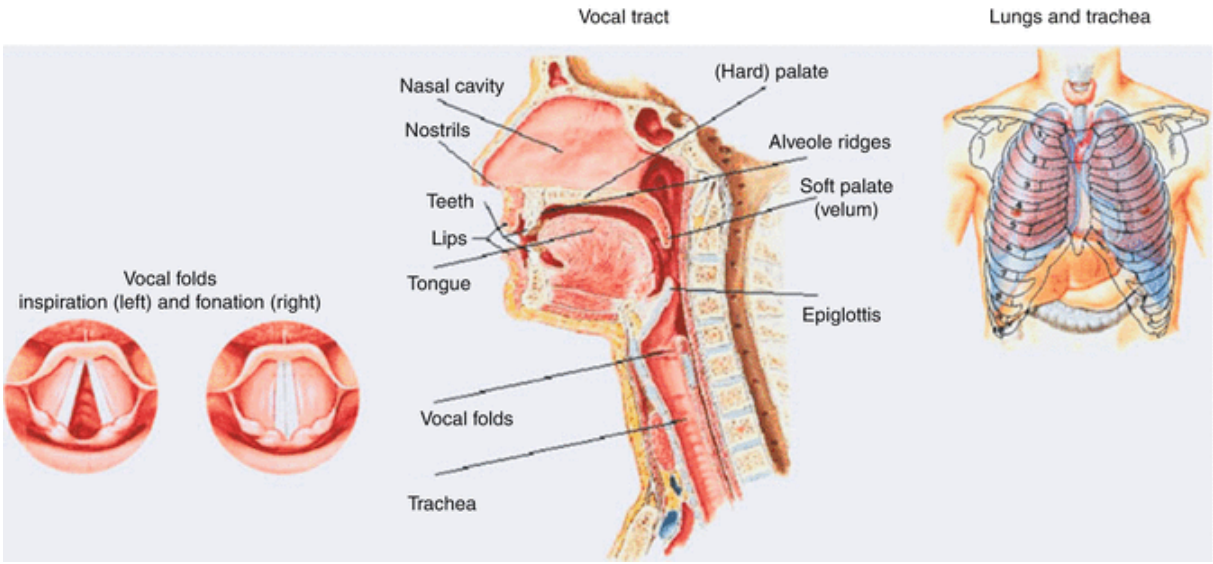


Figure 1: "Schematic view of human speech production mechanism" (Docio-Fernandez & Mateo, 2015, p. 1495)

Acquired Brain Injury (ABI)

The cause of acquired brain injury can be traumatic, if resulting from an external event such as a fall, road traffic accident or lack of oxygen, or non-traumatic, if resulting from an internal

event within the body such as a stroke or tumour (Royal College of Speech & Language Therapists). Speech and language difficulties that can result from ABI include the following:

Apraxia of speech - a motor speech disorder which impairs messaging between the brain and muscles involved with speech, resulting in problems making speech sounds correctly (American Speech-Language-Hearing Association).

Dysarthria - a “collective name for a group of neurologic speech disorders that reflect abnormalities in the strength, speed, range, steadiness, tone, or accuracy of movements required for the breathing, phonatory, resonatory, articulatory, or prosodic aspects of speech production” (Duffy, 2013, p. 4), a condition where control of the muscles used for speech is diminished, resulting in reduced clarity and control of speech (Headway).

Aphasia – an acquired language disorder resulting from brain damage or disease, most commonly in the left cerebral hemisphere, leading to difficulties in comprehension or production of speech, and impacting the ability to read or write (Raymer & Gonzalez Rothi, 2018; National Aphasia Society).

The Boston Neo-Classical model is considered the most popular classification system for identifying subtypes of aphasia, including eight with a symptom specific profile based on speech fluency, ie. continuity, effort, rate and smoothness, comprehension of language and repetition abilities (Sheppard & Sebastian, 2021), one of which is ‘Broca’s Aphasia’ (see Appendix A).

Broca’s Aphasia

Broca’s aphasia is so named due to the ground-breaking work of Paul Broca in the nineteenth century, who suggested that damage to the left frontal lobe, but typically not the right, interfered with articulated speech (Lazar & Mohr, 2011; Kearner & Guenther, 2019).

Broca’s aphasia, often referred to as ‘non-fluent aphasia’ due to the effortful and hesitant quality of speech, is where speech and language is generally understood, but speech output is severely reduced and may be limited to short verbal expressions (National Aphasia Society). Language output tends to consist of mostly content words and few, if any, function words (Sheppard & Sebastian, 2021), for example, ‘I stepped over the cat’ has two content words, ‘stepped’ and ‘cat’, and three function words ‘I’, ‘over’ and ‘the’. The cause of Broca’s aphasia is usually due to experiencing a stroke or brain injury that has damaged the left frontal region of the brain, specifically ‘Broca’s Area’ (Tactus Therapy).

Broca's Area

The brain is divided into the cerebrum, cerebellum, and brainstem (which connects to the spinal cord). The cerebrum has a left and right hemisphere, connected by the corpus callosum which transmits message from one side to the other, and contains four lobes - frontal, parietal, temporal and occipital (see Figure 2). The left frontal lobe contains 'Broca's area' (see Figure 3) (John Hopkins Medicine; Mayfield Clinic), however there appears to be a lack of consensus amongst the language and neurobiology community as to its precise location (see Figure 4) (Tremblay & Dick, 2016). One possible explanation might be inherent heterogeneity in stroke patients where, despite presenting with a specific subtype of aphasia, the location of the lesion can vary (Sheppard & Sebastian, 2021).

Figure 2: Human Brain Anatomy
(John Hopkins Medicine)

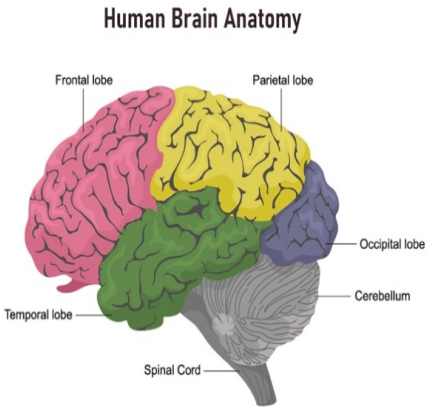


Figure 3: Lobes of the brain, including Broca's area
(Mayfield Clinic)

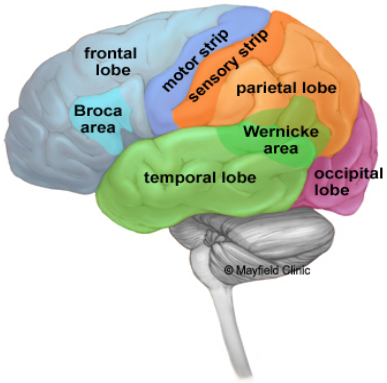
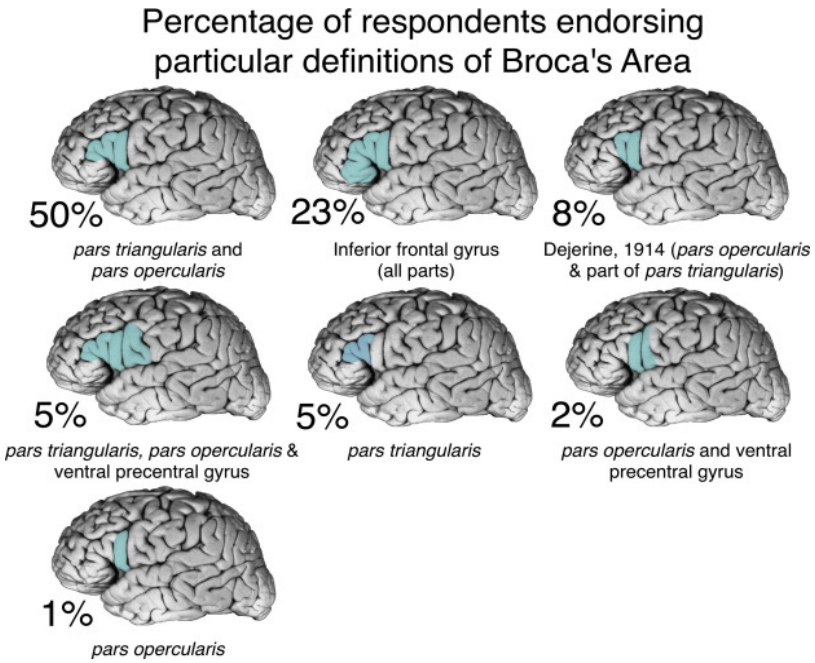


Figure 4: Broca's area - anatomical results of a survey conducted within the language neurobiology community (Tremblay & Dick, 2016, p. 65)



Treatment

Speech and language therapy is the recommended treatment for aphasia (NHS). Melodic intonation therapy (MIT) is one of the most formalised for use with Broca's aphasia (Zumbansen, et al., 2014), and most researched, hence why it is deemed beneficial and recommended for use with this type of aphasia (Thaut, et al., 2014, p. 140). However, despite awareness of the scientific evidence supporting MIT, its use by speech and language therapists may be limited due to lack of training (Behaghel & Zumbansen, 2022).

Melodic Intonation Therapy (MIT)

MIT was developed in the early 1970s and "is a therapy technique that uses melodic and rhythmic elements of intoning (singing) phrases and words to assist in speech recovery for patients with aphasia" (Thaut, et al., 2014, p. 140), involving a combination of rise and fall of pitch in the voice, a steady beat across stressed and unstressed syllables in words and phrases, and rhythmic hand tapping accompanying each syllable (Helm-Estabrooks, 1983, p. 230). Use of the left hand specifically is believed to engage a sensorimotor network in the right hemisphere, providing a neural impulse for verbal production (Marchina, et al., 2023). Appendix B outlines the original MIT protocol.

The basic theory behind MIT is that use of rhythm and pitch engages undamaged language-capable areas of the right hemisphere to aid language recovery and rehabilitation in aphasia

(Helm-Estabrooks, 1983). However, which of these elements is contributing to the efficacy of this therapeutic method, or are both deemed as important as each other, providing an additive effect? This is a hard question to answer, as it can be difficult to identify the active ingredient generating a therapeutic effect, due to a combination of varying approaches and complex patient function (Madill, et al., 2021).

Rhythm and Pitch

A study conducted with German-speaking stroke patients with non-fluent aphasia assessed the relative importance of melody and rhythm for speech production. Their findings were that melodic intoning, or singing, had no effect on the quality of articulation compared with rhythmic speech, suggesting that benefits previously attributed to melodic intoning might be rooted in rhythm and not pitch (Stahl, et al., 2011). This hypothesis, that rhythm could be behind the success of MIT, appears to be at least partially corroborated by the findings of a study in 2020 by Curtis, et al., where they aimed to identify the contribution of rhythmic tapping to treatment outcomes in stroke patients with non-fluent aphasia, and found greater treatment effects with the inclusion of tapping. However, perhaps crucially, this was only the case when participants had been initially assessed as unimpaired on beat entrainment, the ability to tap along to a musical beat. Therefore, despite both research papers suggesting rhythm as the element of MIT bringing most benefit, the basis on which they reach this conclusion is not aligned. They both utilise rhythmic speech, but notably, Stahl, et al., did not allow rhythmic hand tapping to avoid engaging the sensorimotor system.

The efficacy of rhythm might also be supported in a study by Kershenbaum, et al., (2019), investigating the role of unison production in singing and rhythmic speaking of unfamiliar lyrics. They found that, despite a striking improvement in fluency when singing familiar songs, the use of singing, or intoning, did not appear to provide benefit when the aim was to produce new lyrics or spontaneous speech. Instead, it was the regular and predictable rhythm of rhythmic speaking, particularly in unison, that was helpful in promoting fluency. One could argue that rhythm may have been easier to align with more traditional MIT, where syllables are evenly patterned, for example quarter and eighth notes, ie. crotchets and quavers. Whereas the pitches used were more complex, utilising between four and eight notes, a maximum range of a major ninth, and intervals ranging between a major second and major sixth. The original MIT protocol uses minimal pitch variation to represent inflection, the rise and fall of voice in pitch and tone patterns, typically found in speech (Sparks, et al., 1974), with a higher pitch on stressed syllables, lower pitch on unstressed syllables, and an interval between those pitches of a third or fourth, although a minor third is believed to be more commonly used (García-casares, et al., 2022). Hence perhaps the

pitches used were too varied or complex for the participants, which might explain why rhythmic speaking was deemed the stronger element in their study.

Certainly, the pitches used in a study by Zumbansen, et al. (2014) only involved two notes separated by a fourth interval, which is more in line with the original MIT protocol. Their intensive study, conducted with French-speaking, right-handed men was assessing the relative contribution of pitch and rhythm in generalization effect, which is the tendency to respond in the same way to differing stimuli. They compared MIT with the use of rhythmic-speaking and hand-tapping, excluding pitch (RT), and normal speaking with no hand-tapping, excluding both pitch and rhythm (ST), to connected speech, which is the flow and organisation of words and phrases, and non-trained stimuli. They found that MIT had a significant generalization effect on connected speech, whereas RT and ST did not, indicating it was the addition of pitch to rhythm that was efficacious. This could suggest that it is not pitch per se, but perhaps a specific pitch easily achieved by the participant, combined with a particular interval?

To date, there appears to be only one study evaluating the effects of using different melodic intervals in MIT. Darland, et al. (2023) found that MIT utilising a tritone, a gap of six semitones (see Figure 5), resulted in a greater effect size than a minor third, a gap of three semitones (see Figure 4). This was an unexpected result due to their hypothesis that a minor third would have a greater effect size, being more familiar, easier to sing and more reflective of speech prosody. A possible explanation is that the tritone demanded more attention, due to it being less familiar and harder to pitch, potentially promoting neuroplasticity and creating a new neural pathway.

Figure 4: C minor third (Middle C to D# or Eb)
(Jo Warren, Digital Piano)

Figure 5: C tritone (Middle C to F# or Gb)
(Jo Warren, Digital Piano)

Neuroplasticity

“Neuroplasticity can be defined as the ability of the nervous system to respond to intrinsic or extrinsic stimuli by reorganizing its structure, function and connections” (Cramer, et al., 2011). In other words, neurons and neural networks across the brain, spinal cord and nerves can adapt their connections and behaviours in response to varying stimulation.

A systematic review of treatment-related brain changes in aphasia found that rhythmic-melodic based language interventions evoked more changes in the right hemisphere compared with the left, which supports the theory that MIT engages language-capable areas of the right side of the brain (Schevenels, et al., 2020). This review appears to corroborate earlier research, which suggested that the right hemisphere is where perception of music occurs and intonational patterns of speech are associated (Sparks, et al., 1974), and that it also plays an important role in memory and the process of singing, due to a pivotal discovery when a right-handed forty-seven year old male, despite having difficulties with normal speech, retained the ability to recall and sing old songs with minimal hesitation and little articulatory error following surgical removal of their damaged cerebral left hemisphere (Smith, 1966).

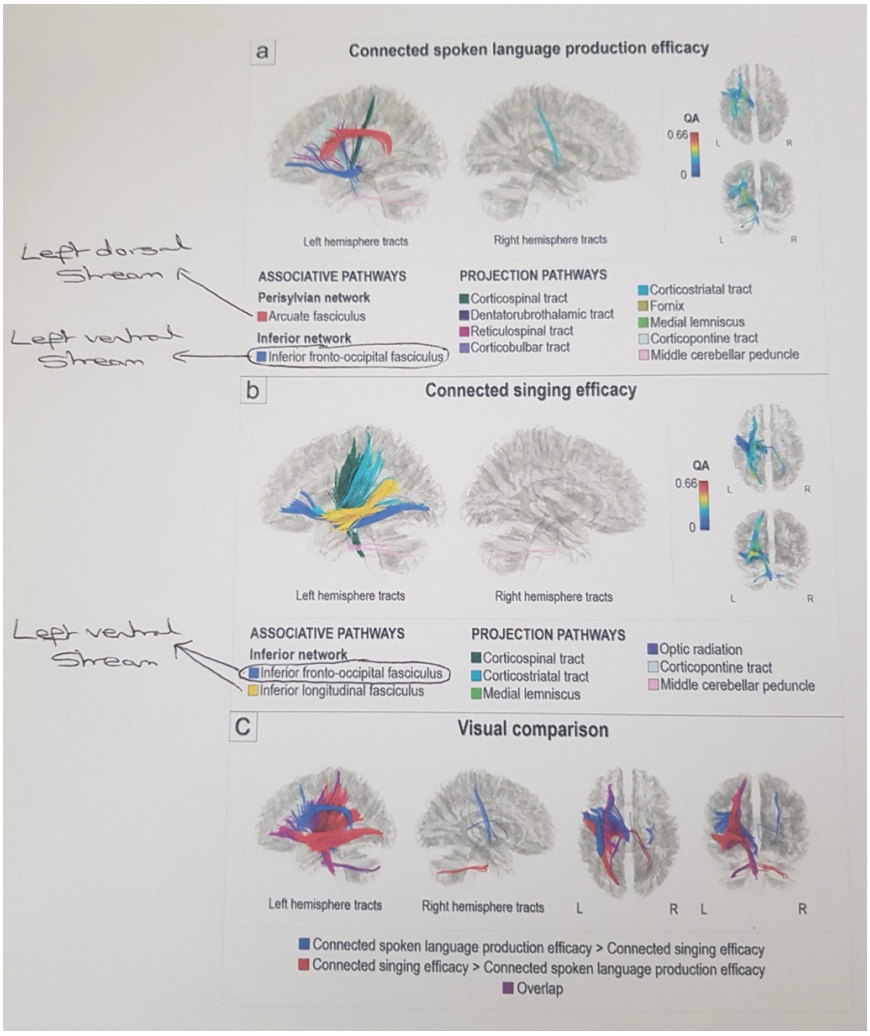
However, a subsequent systematic review studying the effects of MIT in language lateralisation and neuroplasticity in non-fluent aphasia post-stroke patients found that some studies observed greater involvement in the right hemisphere, others observed greater activation in the left hemisphere, or both. As a result, they could not reach a general conclusion regarding any specific mechanism whereby MIT acts on brain plasticity, however, what was clear is that when lesions were only associated with Broca’s area, there was a good response to MIT (García-casares, et al., 2022).

In a proof-of-concept study, findings showed considerable improvements in both speech output and fluency in participants with chronic non-fluent aphasia following a period of intensive MIT sessions. This was measured using speech/language assessments and functional magnetic resonance imaging of the brain (fMRI), which indicated network changes in the right hemisphere of the brain, particularly in the right posterior inferior frontal gyrus (IFG), an area which appears to play a critical role in language and speech-motor recovery (Marchina, et al., 2023). Hence, these findings are supportive of the theory that the right-hemisphere is dominant in aiding speech recovery.

There has been suggestion that pitch might facilitate reactivation of the area surrounding a lesion or damage to the brain, also known as perilesional areas, for language production

(Zumbansen, et al., 2014). This theory could potentially be supported by the results of a combined study by Pitkäniemi, et al (2023) which explored white matter, located in the deeper tissues of the brain, and correlates between production of spoken language and singing in a sample of individuals with post-stroke aphasia. They found that the left hemisphere mainly supported production of speech and singing, and that whilst both dorsal and ventral streams were mostly engaged by speech production, the left ventral stream was primarily associated with singing (see Figure 6). It is believed that the dorsal stream is involved in sensory-motor mapping of sound to articulation, which is control and clarity of speech, and the ventral stream is involved with mapping sound to meaning, the comprehension of speech (Saur, et al., 2008). Hence, it could be hypothesised that the use of pitch in MIT is what contributes to neuroplasticity in the left hemisphere, aiding the development of new neural pathways around the lesion and supporting speech recovery due to shared use of the ventral stream in speech and singing.

Figure 6: “White matter connectomes subserving connected spoken language production efficacy and connected singing efficacy” (Pitkäniemi, et al., 2023, p. 4). Hand-written notes identify left dorsal and ventral streams.



Further, this hypothesis could potentially support the outcome of an earlier case study that used a modified MIT approach, including singing, with an individual ten years post onset of acquired aphasia and apraxia of speech, who was producing more spontaneous and syntactically correct speech, resulting in speculation that treatment had either enhanced or formed new neural pathways due to extending beyond the trained phrases (Slavin & Fabus, 2018). However, the participant was able to sing fluently, despite limited verbal expression, therefore, could retained singing ability, rather than MIT, have been the contributory factor to the suspected neuroplasticity, considering that MIT only usually utilises minimal intervals on pitch to reflect speech prosody?

Limitations

Despite most research on the use of MIT being with Broca's aphasia, it tends to involve either case studies that assess one individual, as was the case with the single-subject design and multimodal approach to MIT by Slavin & Fabus (2018), or groups with small and diverse patient samples, combined with other limitations, such as varying neuroimaging techniques being utilised, adaptations to the MIT approach (for example, different tasks, language or technology used) and no control groups (García-casares, et al., 2022).

Strategy

There are two very different scenarios to consider. The first being how to utilise MIT in sessions with an individual, and the second being how to adapt MIT, or perhaps utilise certain elements, within a group session. Appendix C outlines a shortened version of MIT, condensed in to six stages, which still achieves clinical efficiency whilst preserving the original structure of MIT (Thaut, et al., 2014), followed by how this process could then be followed, or adapted, within individual and group sessions.

As MIT is an individualised therapy, the strategy for an individual would or should be very close, if not completely, aligned with MIT protocol, and therefore this highlights a dilemma in relation to ethical principles, the most important being the potential harm to participants (UK Statistics Authority, 2022). Clients have already acquired a brain injury, and therefore a community musician attempting a therapy such as MIT in their practice would be unethical. However, could they deliver MIT with a suitable client following training with and close supervision by a qualified speech and language therapist (SLT) or neurologic music therapist (NMT)? Hence, the individual strategy assumes this might be a possibility, however, the strategy for use in group sessions, due to being a different dynamic and setting, with a mix of different diagnoses, does need consideration around how the melodic and rhythmic

elements of MIT could be adapted, whilst still retaining fun, motivational and engaging sessions for well-being.

Conclusion

The studies reviewed show that some individuals diagnosed with Broca's aphasia also have acquired apraxia of speech, therefore it is not completely clear which of the diagnoses are responding to the constituent parts of MIT. However, could it be hypothesised, at a basic level, that MIT has rhythm at its foundation, rhythmic speech combined with hand tapping (possible inclusion dependant on an individual's ability to tap along to a musical beat), engaging the right-side of the brain, and that use of pitch, with its link to singing, is what encourages neuroplasticity on the left-side of the brain, aiding development of new neural pathways around the damage in Broca's Area? MIT is a complex and not fully understood therapy, but what appears to be clear is that the use of multiple mechanisms in rhythm and pitch, is what makes MIT a more efficient and efficacious treatment (Merrett, et al., 2014), and hence, the addition of pitch to rhythm could be deemed to provide an additive effect.

Critical Reflection

Reflective practice is "the development of insight and practice through critical attention to practical values, theories, principles, assumptions, and the relationship between theory and practice upon which inform everyday actions" (Bolton & Delderfield, 2018, p. 13). In other words, one can only further develop their practice in a meaningful and progressive way, by reflecting critically, and honestly, on an experience, gaining a deeper understanding of the mechanics behind that experience and enabling associated feelings and observations to be processed effectively. However, to achieve this requires selection of a suitable framework upon which to facilitate reflection.

I was drawn to the Lewinian Experiential Learning Model (Kolb, 1984), due to its simple, but rigorous approach, as I felt it would help me work through my learning experience fully and objectively. I already reflect in my practice, albeit not within an academic framework, and specifically on myself as a practitioner, I have observed a tendency to fixate on what I perceive as negative, occasionally doubting my abilities and feeling inadequate, experiencing what is referred to as 'imposters syndrome'. Hence, I decided to combine my chosen model with Ghaye (2010), a reflective cycle that focusses on positive aspects and emphasizes a strength-based approach, which I believe will help to counteract a tendency to be overly self-critical (see Figure 7).

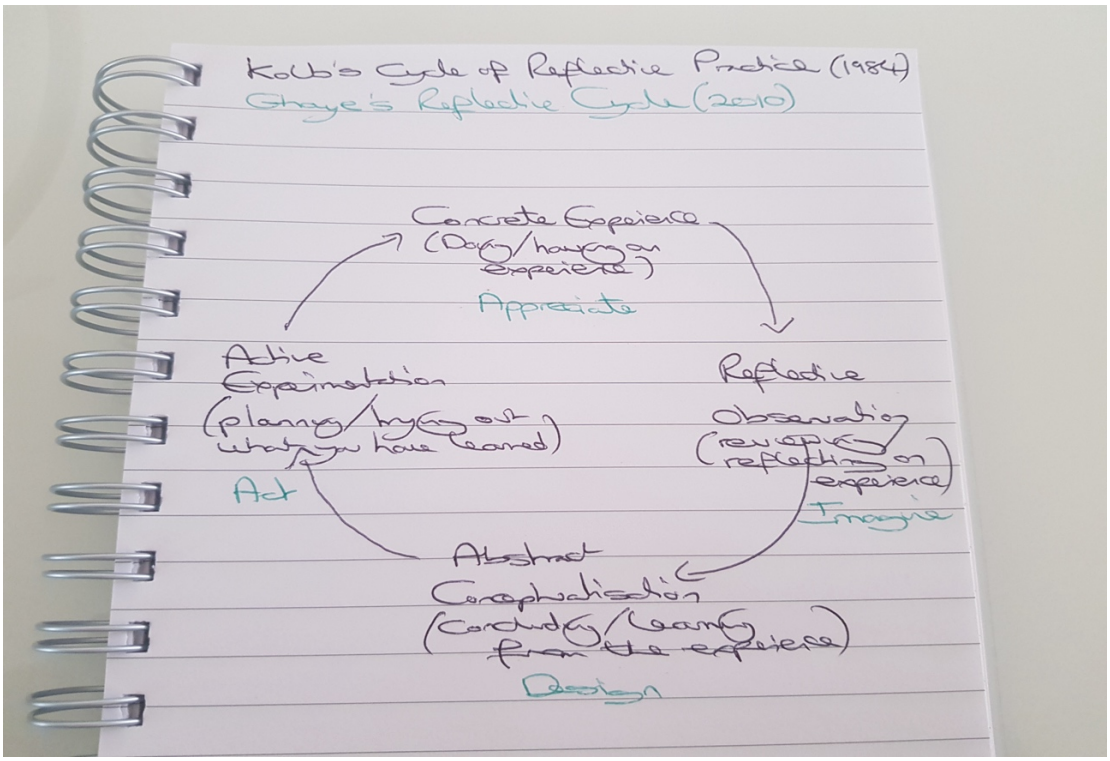


Figure 7: Model Selection (Jo Warren Notebook)

At the start of the module, I questioned if I should continue the theme from my formative assignment, evaluating the impact of group singing on mental health and well-being, or research something new. I decided to explore the relationship between singing and speech, as several of my clients' experience difficulties with their speech, however, I did not know where to focus my research. Therefore, my initial reading was not as organised as it could have been, and although I believe it was necessary to allow freedom of exploration without a self-imposed boundary too early on, this led to feelings of unease and inefficient note taking. I do, however, connect with "learning involves risk, as experiential learning incorporates novel, challenging, experiences" (Morris, 2020, p. 1068), and believe we need to feel a little uncomfortable to be challenged and develop practice, hence I had to learn to become comfortable with that feeling, which I view as a positive first step. Consequently, I would feel more confident to approach a field of interest without specifics in future, at least initially, remaining open-minded in where my learning might take me.

I felt more settled when I narrowed down my focus, however, the feelings of unease remained because it became more apparent how incredibly complex the brain and voice are, and that despite advances in understanding, there is still much debate and research to be done. I also realised how limited my exploration would be in this field, due to time constraints and not being able to read all the literature that exists, acknowledging the best I could hope

for was to have acquired at least some knowledge in this area, considered theoretical application thereon, and accept I would end up with more questions than when I began.

I considered if the use of short statements in MIT might indicate minimal rhythmical options, perhaps suggesting that this element is more aligned across research than pitch, but due to not providing specific details of the rhythms used, combined with different languages used in the literature I reviewed, including English and German, stress-timed languages, and French, a syllable-timed language (Stahl, et al., 2011), I found myself attempting to compare research that wasn't aligned, resulting in difficulty reaching a robust conclusion. Further, with regards to the left-hand tapping element of MIT whilst intoning to engage the right hemisphere of the brain, I am curious as to what adaptation, if any, might be used with an individual who is dominant on their left side, however, as most of the population is dominant with their right hand, it is not surprising that research on MIT has involved right-handed individuals.

I was only able to find one research paper that investigated the effects of interval variation used in MIT, and although specific pitches weren't mentioned, it has been suggested that where an individual has preserved musical skills, the melodic aspects of MIT would probably be easier to manage than for individuals who do not have a musical background (Zumbansen, et al., 2014). This seems logical, as the right hemisphere of the brain is understood to play an important role in memory, perception of music and process of singing, and therefore damage in Broca's Area, on the left-hand side of the frontal lobe, would not be affected. However, regardless of musical background, a good starting note would be a pitch that is easily achievable by that individual, using a minimal interval such as a major or minor third, and as they progress perhaps extending pitch by increasing intervals, enhancing focus, and hopefully expanding and strengthening neural pathways.

Within the strategy section of my paper, and specifically considering my work with individuals, ethics became an obstacle, as SLT's and NMT's are qualified to administer MIT, whereas I am not. Based on my research, I did not feel confident I could adapt MIT enough for a session with an individual, that would remain meaningful and efficacious, whilst retaining engagement and enthusiasm, particularly as the protocol itself could be deemed monotonous in nature and not particularly engaging (Lagasse, 2012), whilst also not breaching ethics. Certainly, the rhythmic and melodic elements could be utilised, but this might then veer towards a normal singing session, which considering people with non-fluent aphasia are generally known to be able to sing the text of a song whilst being unable to speak those same words (Özdemir, et al., 2006), could suggest that my session might be

enjoyable and beneficial for well-being, but unlikely to contribute to improvement of speech production as a side-effect without an underpinning framework.

The study conducted by Kershenbaum, et al., (2019) found that when a subset of the group returned for further testing, they benefitted from singing compared to speaking when not cued or instructed to speak rhythmically, indicating that continuing to sing following a rhythmic intervention, or MIT specifically, might contribute to improved spontaneous speech. Therefore, perhaps, following MIT with an SLT or NMT, the next step could be referral to a music and singing group for people with an ABI, for additional support in a fun and social setting with their peers. Hence, this is an area I would like to explore in my PDP (see Appendix D).

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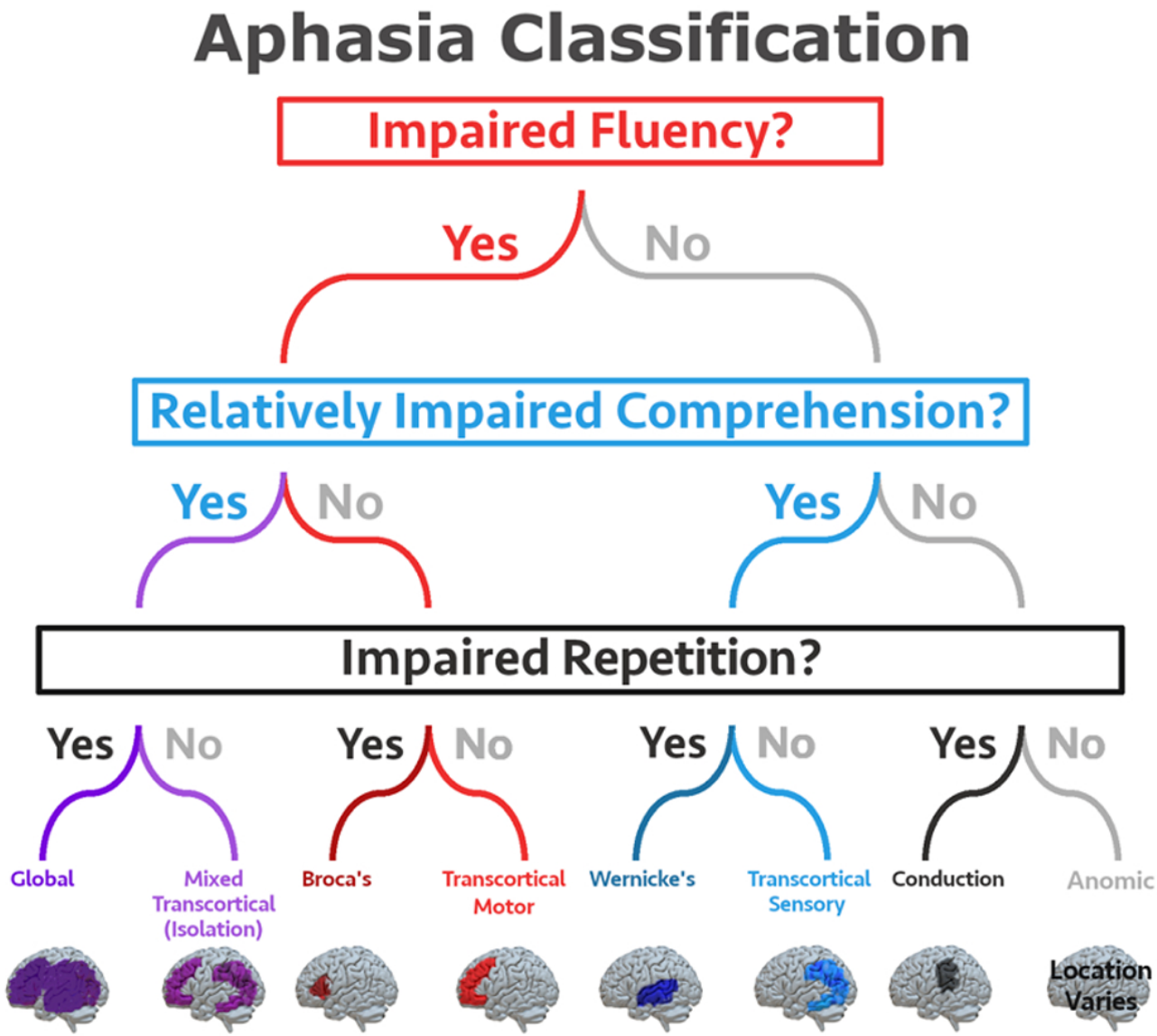
Appendix A

(Sheppard & Sebastian, 2021)



Appendix B – Original MIT Protocol

(Sparks, et al., 1974)

The original MIT protocol is across two levels. First level consists of four steps, the second level consists of five steps. Tempo of melodic intonation, particularly in the first level, is slower than normal speech prosody.

Level One

1. No verbal response from patient. Therapist intones sentence and assists patient in hand-tapping rhythm-stress pattern of sentence.
   A suggested preliminary step for each sentence is to introduce the melody pattern non-vocally by piano, recording, or other means.

2. Patient is asked to join therapist in repeated unison intoning of sentence and encouraged to increase participation with each repetition.
   Hand-tapping accompanies this step.

3. The same as step two, except therapist gradually fades participation whilst encouraging patient to continue on their own.
   Hand-tapping accompanies this step.

4. Intoned presentation of sentence by therapist followed by intoned repetition by patient.
   Hand-tapping accompanies this step.

Level Two

Hand-tapping is discontinued after first step. Use of backups is introduced for each step if failure occurs. A sentence is discontinued if failure occurs when a repeat trial of step is attempted following backup. The major purpose of this level is to return to use of speech prosody. Abruptness of transition can be minimized if intonation patterns have been correctly plotted. Smoothing of transition from sung to spoken intonation involves therapist using Sprechgesang (speech-song) technique, which retains rhythm and stress of a melodic contour whilst substituting changing pitch of speech for constancy of pitch in sung notes.

1. Intoned presentation of sentence by therapist followed by two or three seconds of enforced latency, then repetition and hand-tapping of intoned sentence by patient. Backup is intoned phonemic of first word cueing by therapist, followed by intoned repetition of entire sentence by patient.

2. Patient remains silent whilst therapist presents sentence in Sprechgesang.

3. Patient joins therapist in unison repetition of sentence, with fading participation by therapist. Therapist will again present in Sprechgesang. Patient may continue to intone or, ideally, convert to spoken melody at this time. Either response is acceptable. Backup is full unison participation by therapist.

4. A – Spoken presentation of sentence for the first time by therapist and immediate spoken repetition by patient. Conversion to spoken prosody is required. Backup is unison spoken repetition by therapist and patient, with fading participation by therapist.

   B – Modified fourth steps involves an enforced latency of two seconds between completion of therapist's presentation and patient's repetition. Backup is the same as in step 4A.

5. A – Prompt presentation of appropriate question by therapist which patient must answer by giving target sentence. Backup is spoken presentation of sentence followed by two or three seconds of enforced latency, then repetition by patient.

   B – Modified fifth step introduces a latency of two or three seconds between completion of fourth step and question by therapist. Latency may be increased as patient is successful in retrieving target sentence. Backup is cueing by therapist, at most the first word of sentence, preferable first phoneme of that word.

Appendix C - Strategy

Thaut, et al. (2014) p. 142	Strategy – Individual	Strategy – Group
1. Therapist presents intoned statement via humming whilst hand tapping with patient (left hand, palm down). Patient listens to presentation.	Choose a statement with and for client, that is relevant to them. An example already referenced on page three of the paper has been used: 'I stepped over the cat'. Consider pitch and interval that would be best for them to intone easily, prior to humming. For example, this could be using a D (above middle C) and F# (major 3rd). Also consider time signature and rhythm to be used. Statement: 'I stepped o--ver the cat' Pitch: D D F#D D D 4/4 Time Signature: 4 1 2 3 4 1 2 3 4 Crotchets (or 1 beat) = All words, excluding 'over' Quavers, or quarter notes, (2 over 1 beat) = Over Sit and face client and hum intoned statement whilst hand tapping with them, as they listen.	Incorporate melodic and rhythmic elements of MIT within vocal warm-up section at start of session. This could follow vocal sirens, or glides, across a minimal pitch range based on intervals to be used in intoned statement. Statement: 'We are ready to sing?' Pitch: C C E E C C 4/4 Time Signature: 1 2 3 4 1 Crotchets (or 1 beat) = All words, excluding 'ready'. Quavers, or quarter notes = Ready Sit and face clients in a semi-circle and hum the intoned statement whilst hand tapping together, if they are able, as they listen.
2. Therapist sings intoned statement in several repetitions whilst hand tapping with patient. Patient listens to presentation.	Sing intoned statement, repeating several times whilst hand tapping with client as they listen.	Ask group to join in on the hum over intoned statement, as part of warm-up, then sing the intoned statement, repeating a few times whilst hand tapping with the group as they listen.

3. Therapist sings and invites patient to join in. Therapist and patient sing together with several repetitions. Therapist continues to aid patient's hand tapping, progressively fading as patient shows more independent tapping motions.	Sing intoned statement again, and continue hand tapping with client, this time inviting them to join in. Repeat in unison several times, and then gradually fade out tapping as client becomes more independent with this action.	Ask the group to join in on intoned statement, whilst hand tapping. Repeat in unison a few times.
4. Therapist fades during singing with patient. Hand tapping continues.	Gradually fade out singing with client, so they are intoning and hand tapping on their own.	Ask group to incorporate a percussive instrument, in place of hand tap, whilst singing, directing that they increase volume whilst practitioner decreases volume and then bring to a natural end.
5. Therapist sings first and then stops and cues patient to respond by intoning independently. Hand tapping continues. Therapist may increase the time for patient to respond after each repetition to exercise ability to retrieve words.	Sing first, stopping to cue client to respond independently, but continue hand tapping. If a confident first response, then repeat, allowing a longer gap before cueing client to respond, to avoid automatic/instinctive responses, and encouraging more control.	Practitioner sings, then stops, whilst everyone continues percussion tap, and like a conductor, indicate when the group should sing in response.
6. Therapist asks one or more questions about information in the exercise statement. Patient may respond by intoning or in normal speech. Therapist does not assist with hand tapping. Patient may or may not use tapping spontaneously.	Ask a question about statement – for example, 'what did you step over?', allowing client the time they need to respond (either through intoning or normal speech, and with or without hand tapping).	Ask a question about statement – for example, 'what are you ready for?' Response is sung, or spoken, with or without hand taps/percussion, depending on individuals in group, and then ready to continue with the session.

Individual – Additional Note:

Prepare several statements relevant to client. If client struggles, limit retry to once, to avoid repetition of errors that might reinforce that error. If unsuccessful on retry, start process again with a different statement.

Appendix D - Personal Development Plan

Goal	What do I want to achieve?	What actions will I take?	How will I measure success?	Target date for completion
To incorporate MIT within my practice (if possible).	Explore if and how I can utilise MIT within my practice, on both an individual and group basis.	Liaise with qualified Speech and Language Therapists (SLT's) and Neurologic Music Therapists (NMT's) regarding ethical boundaries around use of MIT and discuss ideas around how I might be able to adapt its use to sit comfortably within those boundaries from a legal and ethical perspective (if at all). If utilising MIT is possible, enquire as to possibility of training and supervision and what tools can be used to measure MIT use and assess outcomes.	If incorporating MIT within my practice isn't possible, then I would have only succeeded in exploring the possibility. If incorporating MIT within my practice is possible, success will be from assessment of outcomes - are individuals showing improvement in speech, and what is impact on well-being as a result?	June 2024 March 2025
Explore referral to music/singing group (or 1-2-1).	Discuss possibility of referral to a music/singing group,	Liaise with qualified SLT's and NMT's – what usually happens when they conclude therapy sessions with an individual? Do they, or could		June 2024

	and/or individual sessions.	they, refer to a community musician/singing group leader? If so, how does/might that work? Ask for advice – what would help further inform my practice and is there particular literature or research they recommend I read? An NMT, for example, would have speech improvement as the goal utilising musical tools to achieve that goal, whereas I have music and singing sessions for fun and well-being as the goal, hence what can I incorporate within the content of sessions that might help improve speech as a side-effect?		