

# Cognitive Behavioural and Melodic Intonation Therapies on Verbal Communication Skills of Persons with Apraxia of Speech

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**Abstract:** The study investigated the effect of cognitive behavioural therapy (CBT) and melodic intonation therapy (MIT) on the verbal communication skills of persons with apraxia. A pre-test, post-test, and control group quasi-experimental research design was used with a sample of persons with post-stroke apraxia receiving speech and language therapeutic services in Ibadan Metropolis. University College Hospital was selected as the treatment center for the study. Thirty persons with apraxia were purposively selected and assigned to one of three groups: CBT, melodic intonation therapy, or control (N = 30, male = 16, female = 14, mean age = 63.1 years). Twenty-four sessions of CBT and melodic intonation therapy classes were held with the experimental group only. The control group was exposed to placebo treatment over the same period. An apraxia of speech rating scale (ASRS) was administered to assess the verbal communication skills of the prospective participants. Those who met the inclusion criteria were selected for the study. The instruments used were the ASRS, the English proficiency test of oral communication skill rating scale, and two self-developed therapeutic plans. Data were analysed using analyses of covariance and Scheffe's post-hoc test at a 0.05 level of significance. There was a significant main effect of treatment (CBT and MIT) on the verbal communication skills of the participants ( $F_{(2,11)} = 200.84, P < 0.05, X = 0.56$ ). Participants in the MIT group had the highest mean score (56.20), followed by those in CBT (37.90), while those in the control group had the lowest mean score (23.80). CBT and MIT were effective in enhancing the verbal communication skills of persons with apraxia. However, MIT showed better outcomes than CBT. Therefore, it is appropriate for speech therapists, pathologists, and other relevant practitioners to adopt these strategies to improve the verbal communication skills of those with apraxia.

**Keywords:** Apraxia of speech, cognitive behavioral therapy, melodic intonation therapy, verbal communication skills, persons with apraxia of speech.

## INTRODUCTION

A person with apraxia of speech (AOS) has poor social communication skills. The severity of impairment regarding expressive language functioning varies across populations. There is a strong correlation between the severity of motor and intellectual impairments and the prevalence of speech, language, and communication impairments [1-4]. Aphasia affects many adults, particularly in environments with challenging sound conditions. The disorder is characterised by a limited phonemic inventory, inconsistent speech errors, vowel errors, articulatory difficulties, suprasegmental dysfunction, expressive language deficits, difficulties processing sounds, and reading and spelling difficulties [5, 6]. Insufficient receptive vocabulary knowledge contributes to or indicates difficulties with oral communicative competence, increasing the risk of rejection [7]. Communication disorders include a wide range of language disorders [8]. The most critical language disorders are those that affect reception and expression. Language and speech are difficult for

children with receptive language disorders [9]. On the other hand, a child with expressive language disorders has difficulty expressing his or her opinions, thoughts, desires, and feelings [10].

Language is the process of communicating thoughts, feelings, ideas, and messages using the tongue, lips, palate, and respiratory system [11]. Some studies have indicated that receptive vocabulary knowledge is directly related to the ability to express oneself using oral language [12, 13]. According to Celce-Murcia [14], orally expressing oneself is a complex and multifaceted skill with multiple sub-abilities. Impaired speech intelligibility might result from the affected dimensions, creating misperception, difficulties, and communication challenges. It would be easy for healthcare providers to attribute these difficulties solely to the person's aphasia. The difficulties may also be caused or contributed by other factors, such as cognitive problems, emotional problems (like anxiety), and sensory impairments (like hearing loss) [15].

The respiratory system is the first part of the body that produces speech sounds. Our respiratory system provides a powerful flow of air essential for speech [11]. According to Cruice, Worrall, and Hickson [16],

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approximately two-thirds of people with aphasia suffer from clinical depression. It is generally believed that communication difficulties in individuals with aphasia may be related to emotional distress [17]. It is necessary to identify the factors contributing to a person's difficulty in understanding speech to determine the nature and severity of their aphasia. This process aims to determine the best way to support the individual and ensure appropriate treatment is provided as necessary. It might be appropriate to provide a hearing aid to an individual whose comprehension problems are exacerbated or caused by hearing loss.

There is little education among mental health professionals regarding the nature of aphasia and no training on how to communicate with people who have aphasia [18]. Psychotherapists reported no experience of working directly with persons with aphasia [19]. Surprisingly, there is a need for more detailed information regarding the effectiveness of quality classroom literacy instruction for children with speech and language difficulties. For children with speech and language difficulties, most intervention studies aim to improve reading and spelling development [20]. The results of individual-level interventions suggest that integrating speech, reading, and spelling goals may be beneficial. Through focused and evidence-based phonemic awareness interventions, it is possible to simultaneously improve speech production, phonological awareness, word reading, and spelling [21, 22]. The current study employed a controlled research design to explore the effectiveness of cognitive behavioural and melodic intonation therapies on the verbal communication skills of persons with AOS.

## Literature Review

AOS often affects purposeful movement patterns and automatic speech. Individuals with this communication disorder have difficulties connecting speech messages from the brain to the mouth. This can result from brain injuries, such as a stroke or a progressive illness [23]. The inability to utilise motor planning from the brain to perform movements necessary for speech production during a child's language learning process is known as developmental AOS. Although the causes between AOS and developmental AOS differ, the main characteristics and treatments are similar [24]. Persons with AOS have difficulties stringing syllables together in the appropriate order to make words or are totally unable to do so. The definition of AOS has been the subject of heated

debate over the past 30 years [25, 26], and there is currently no universally accepted definition [23]. Various theoretical frameworks have been used to define AOS: behavioural, cognitive, and neuroanatomical [27], acoustic, and phonetic-perceptual [28]. Despite the high level of theoretical interest, it remains unclear how each framework can be used to differentiate between aphasia and dysarthria.

Despite considerable theoretical debate and the absence of commonly accepted definitions, speech and language therapists working in clinical practice can make highly reliable diagnostic decisions about the severity of AOS [29]. Several risk factors are related to AOS, including genetic predisposition, persistent speech disorder, and poor phonological awareness [30]. Persons with the disorder have been reported as having more difficulty with written language than people with other disorders [22, 31]. They may exhibit speech inconsistencies, such as being able to say a word properly at certain times but not at others, especially when it is necessary to speak those words. It is usually easier for the individual when they are not trying too hard to speak. They could also omit consonants at the beginning or end of words and appear to grope or struggle to form words.

According to Duffy [32], AOS accounts for 6.9% of all motor speech disorders in speech pathology practices. The prevalence of acquired AOS has also been reported as 7.6% [33]. The incidence and prevalence of AOS in adults are not well documented. There are challenges associated with collecting these data due to the common occurrence of AOS together with aphasia and dysarthria [32, 34]. It is also difficult to distinguish between phonological errors and aphasia characteristics. Aphasia is a secondary communication disorder that occurs more frequently in conjunction with apraxia (i.e. when aphasia is the primary communication disorder). It is rare for apraxia to occur in its pure form without a secondary disorder [35].

Children with intellectual disabilities can usually complete academic and non-academic tasks. However, their inability to pay attention to detailed instructions often leads to failure [36]. It is vital to implement appropriate teaching strategies to enhance the attention of children with intellectual disabilities during the teaching and learning process to ensure that the skills needed to perform assigned responsibilities are effectively developed [36, 37]. This study seeks to determine the effectiveness of melodic intonation therapy and cognitive behavioural therapy (CBT) as

therapeutic options for the verbal communication skills of persons with AOS.

### **Cognitive Behavioural Therapy**

CBT is a psychotherapeutic approach that addresses dysfunctional emotions, maladaptive behaviours, and cognitive processes and contents through several goal-oriented and explicit systematic procedures. The name refers to behaviour therapy, cognitive therapy, and therapy based upon a combination of basic behavioural and cognitive principles and research [38]. Most therapists working with patients dealing with anxiety and depression use a blend of cognitive and behavioural therapies. This technique acknowledges that there may be behaviours that cannot be controlled through rational thought. CBT is problem-focused (undertaken for specific problems) and action-oriented [39].

CBT is based on a straightforward, common-sense model of the relationships between cognition, emotion, and behaviour [40] and is thought to be effective for the treatment of a variety of conditions, including mood, anxiety, personality, eating, substance abuse, and psychotic disorders. Many CBT treatment programmes for specific disorders have been evaluated for efficacy. The healthcare trend of evidence-based treatment, where specific treatments for symptom-based diagnoses are recommended, has favoured CBT over other approaches, such as psychodynamic treatments. Critically, CBT has durable effects long after treatment completion [41], even when there is interference from factors outside the individual's control (for example, medication and physical symptoms). Evidence shows that cognitive factors play a central role in developing and maintaining speech anxiety [42]. Speech anxiety may be associated with negative self-evaluation, perceived negative evaluation from others, and biased information processing [43]. In several well-controlled clinical trials, interventions targeting maladaptive cognitions have demonstrated clinical efficacy [44]. Previous research has shown that maladaptive cognitions can be altered to reduce speech anxiety symptoms [45].

CBT assumes that changing maladaptive thinking leads to changes in effect and behaviour, but recent variants emphasise changes in one's relationship to maladaptive thinking rather than changes to thinking itself [46]. Therapists use CBT techniques to help individuals challenge their patterns and beliefs and replace errors in thinking – such as over-generalising, magnifying negatives, minimising positives, and

catastrophising – with more realistic and effective thoughts, thus decreasing emotional distress and self-defeating behaviour. These errors in thinking are known as cognitive distortions. CBT techniques may also be used to help individuals take a more open, mindful, and aware posture towards them to diminish their impact. CBT helps individuals replace maladaptive coping skills, cognitions, emotions, and behaviours with more adaptive ones by challenging their way of thinking and the way they react to certain habits or behaviours [47]. A controversy remains, however, about the degree to which these traditional cognitive elements account for the effects identified with CBT over and above earlier behavioural elements, such as exposure and skills training [48].

### **Melodic Intonation Therapy**

Another technique that is gaining popularity for the treatment of AOS is melodic intonation therapy (MIT). MIT was initially designed to treat severe non-fluent aphasic patients [49]. This treatment uses the natural prosody of language to improve the expressive language by capitalising on preserved function (melody) and engaging language-capable regions in the undamaged right hemisphere [49]. Many studies have been conducted to test the effectiveness of MIT for cases of aphasia. Morrow-Odom and Swann [50] conducted a study on the effectiveness of MIT when treating expressive language. This study followed the case of a 65-year-old participant who experienced a unilateral, right hemisphere, intracerebral, haemorrhagic stroke. The treatment typically involved the clinician asking the client to sing a target phrase while tapping the left hand, gradually decreasing the support of the clinician until the patient sang the phrase alone. The last step would involve the transition from singing to speaking the phrase [51]. While the treatment may appear simple, it is incredibly complex.

MIT uses the four aspects of intonation, tapping, inner rehearsal, and auditory-motor feedback training to produce intelligible speech [52]. Intonation is the core of MIT. Overall, MIT tries to increase reliance on the right hemisphere of the brain. Studies have proved that the right hemisphere of the brain predominately deals with the processing of song prosody. Therefore, a slower rate of articulation and continuous voicing that increases connectedness between syllables and words in singing may reduce dependence on the brain's left hemisphere [49]. Tapping the left hand also helps reduce the dependence on the brain's left hemisphere. The tapping of the left hand engages a right-

hemisphere sensory-motor network that controls both hand and mouth movements [53]. Engaging this part of the brain could improve fine motor movement required for speech. Inner rehearsal is vital for apraxic speech. A client who practices silently can re-initiate a cascade of activation by intoning the target phrase, giving them another chance to sequence the motor commands correctly [49].

The last aspect of MIT is auditory-motor feedback training. For clients who are aphasic or apraxic, it may be increasingly difficult to process auditory feedback efficiently to self-correct. However, if words are sung, phonemes are isolated and thus can be heard distinctly while still connected to the word. In addition, sustained vowel sounds provide time to think ahead about the next sound, make internal comparisons to the target, and self-correct when sounds produced, begin to go awry [49].

## METHODOLOGY

Based on a quasi-experimental research design, the study adopted a pre-test, post-test, and control group factorial matrix of  $3 \times 2$ . In this study, three types of interventions were considered (CBT, MIT, and control). The design is represented thus:

Cognitive Behavioural Therapy Group 1: (E1)	$O_1 X_1 O_4$
Melodic Intonation Therapy Group 2: (E2)	$O_2 X_2 O_5$
Control Group 2: (E3)	$O_3 O_6$

Where:

Experimental and control groups' pre-test scores are represented by  $O_1$ ,  $O_2$ , and  $O_3$ , respectively.

Post-test scores for the experimental and control groups are represented by  $O_4$ ,  $O_5$ , and  $O_6$ .

An experimental group (CBT) is represented by  $X_1$ .

An experimental group (MIT) is represented by  $X_2$ .

## Hypotheses

The following hypotheses were formulated and tested at the 0.5 level of significance:

$H_{01}$ : There is no significant main effect of treatments (MIT and CBT) on the verbal communication skills of a person with AOS.

$H_{02}$ : There is no significant main effect of gender on the verbal communication skills of persons with AOS.

$H_{03}$ : There is no significant main effect of age on the verbal communication skills of persons with AOS.

## Participants

The target population of this study comprised persons with post-stroke apraxia receiving speech and language therapeutic services in the Ibadan Metropolis. There were 30 participants in the study, of whom 45% (13) were females and 55% (17) were males. The participants were selected using multi-stage sampling. University College Hospital was selected as the treatment centre for the study. The AOS rating scale (ASRS) was administered to assess the verbal communication skills of the participants, and those who met the inclusion criteria were selected for the study. This was done using a purposive sampling technique, and 30 participants were randomly selected. We randomly assigned participants to one of three treatment groups, CBT, MIT or control, depending on their treatment type. Ten post-stroke patients were randomly assigned to each of the experimental groups. In the CBT group, there were 4 males and 6 females with a mean age = 65.2; in the MIT group, 10 post-stroke patients were selected (male = 5; female = 5; mean age = 67.6); and 10 post-stroke patients were assigned to the control group (male = 4; female = 5; mean age = 65.8). Participants in CBT were exposed to cognitive behavioural therapy, those in MIT were exposed to melodic intonation, and participants in the control group were exposed to a placebo method and served as the control group.

## Instrumentation

### Melodic Intonation Therapy

MIT is an evidence-based treatment method for improving expressive language in people with aphasia using intonation (singing). This approach utilises the undamaged right hemisphere by engaging areas capable of processing language. The melodic and rhythmic prosody, slower articulation rate, and continuous voicing that results from MIT may reduce dependence on the left hemisphere. The group attended three 45-minute sessions each week during the six-week treatment period. The total number of sessions was 18.

### Cognitive Behavioural Therapy

The purpose of CBT is to review and rework unhelpful thinking patterns and behavioural habits. It is, therefore, an effective method for disentangling

unsuccessful communication strategies and, subsequently, altering and improving communication styles. As part of the CBT session, the therapist used the ABC model to examine participants' thoughts and how they contributed to problematic speech production. CBT uses the ABC model to identify irrational beliefs and events. The acronym stands for antecedents, beliefs, and consequences. To respond to situations in a healthy way, the ABC model teaches rational thinking. During the six-week treatment period, the group attended three weekly sessions lasting 45 minutes each. The total number of sessions was 18.

### **AOS Rating Scale**

The purpose of the ASRS is to quantify the presence or absence of, relative frequency, and severity of specific characteristics often associated with AOS. Strand *et al.* [34] found excellent intra- and inter-judge reliability for the ASRS. A significant correlation was found between ASRS scores and independent clinical judgments of AOS severity, demonstrating validity. In another study of chronic AOS after stroke, the ASRS total score had excellent inter-judge reliability. The instrument was rated by two experienced researchers who were not involved in its development. Inter-judge agreement for the ASRS total score was found to vary from moderate to excellent (mean ICC = 0.69, 95% CI [0.60, 0.77]). A moderate or reasonable rating was assigned to most mean item-level agreements. The ASRS total score had poor inter-judge reliability (ICC = 0.42, 95% CI [0.35, 0.50]). Several items were not in agreement, ranging from moderate to poor results.

### **English Proficiency Test of Oral Communication Skill Rating Scale**

An oral proficiency test measures an individual's oral English proficiency. The oral proficiency test rating scale ranges from 0 (low) to 4 (high), using recognised standards for oral English proficiency. The tests are graded on pronunciation, speech flow, grammar, vocabulary, organisation, listening comprehension, and question handling. The test has three sections: pronunciation, question handling, and final score.

### **Method of Data Analysis**

The null hypotheses of the study were tested using the analysis of covariance at a 0.05 level of significance.

### **Ethical Considerations**

Participants were duly informed about the aim of the study. They were required to attend a one-day meeting

with the researcher at the intervention location on a specific day. In line with the research ethics, the researcher held a meeting with the participants where the content of the consent form was explained to them by a research assistant in their native language. Once adequate understanding was ensured, each participant completed and appended their signature to the consent form. Participants were assured of the confidentiality of their profiles and responses. A significant limitation of the study was the absence of recordings of the sessions.

## **RESULTS**

### **Hypotheses Testing**

**H<sub>0</sub>1: There is no significant main effect of treatments (cognitive behavioural and melodic intonation therapies) on the verbal communication skills of persons with AOS.**

The results from Table 1 reveal that there was a significant main effect of treatments (cognitive behavioural and melodic intonation therapies) on the verbal communication skills of people with AOS ( $F_{(2, 11)} = 200.84, p < 0.05, \eta^2 = 0.97$ ). This means there was a significant difference in the mean scores of treatments of persons with AOS who received CBT and MIT, and the control group, showing that MIT and CBT were effective as treatment options on the verbal communication skills of persons with AOS. Therefore, hypothesis one is rejected.

**H<sub>0</sub>2: There is no significant main effect of gender on the verbal communication skills of persons with AOS.**

Table 1 reveals no significant main effect of gender on the verbal communication skills of persons with AOS ( $F_{(1, 11)} = 0.470, p > 0.05, \eta^2 = 0.04$ ). It can be inferred that there was no significant difference in the mean scores of the verbal communication skills of persons with AOS in relation to their gender. Hence, hypothesis two is accepted.

**H<sub>0</sub>3: There is no significant main effect of age on the verbal communication skills of persons with AOS.**

The results in Table 1 established that there was no main statistically significant effect of age on communication skills ( $F_{(1, 11)} = 0.35, p > 0.05, \eta^2 = 0.031$ ). This implies that the mean scores of participants were not statistically different from each

**Table 1: Summary of 3 × 2 × 2 Analysis of Covariance Post-Test Verbal Communication Skills of Persons with AOS**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5437.268 <sup>a</sup>	18	302.070	40.018	0.000	0.985
Intercept	16803.914	1	16803.914	2226.164	0.000	0.995
Pretest	112.601	8	14.075	1.865	0.167	0.576
Treatment group	3032.092	2	1516.046	200.844	0.000	0.973
Gender	3.550	1	3.550	0.470	0.507	0.041
Age	2.667	1	2.667	0.353	0.564	0.031
Error	83.032	11	7.548			
Total	51855.000	30				
Corrected Total	5520.300	29				

a. R Squared = 0.985 (Adjusted R Squared = 0.960)

other regardless of age. Thus, the null hypothesis is accepted.

## DISCUSSION OF FINDINGS

### The Main Effect of Treatments (Cognitive Behavioural and Melodic Intonation Therapies) on the Verbal Communication Skills of Persons with AOS

The findings of this study revealed a significant effect of CBT and MIT on improving the verbal communication skills of persons with AOS. This is in line with the work of Al-Janabi *et al.* [54], who investigated whether the right hemisphere of the brain of patients with AOS could be engaged using MIT. His results showed that participants improved in verbal fluency and repetition of words and phrases after the administration of a linguistic battery. Van der Meulen *et al.* [55] recorded a similar result using a randomly allocated experimental group for MIT and a control group. The researcher further reported that there was a significant effect in favour of the MIT experimental group on language repetition and verbal communication but not for the control group. The present finding confirmed that of Burton, Pakenham and Brown [56], which stated that CBT effectively improved psychological competence. It is an effective intervention treatment for the psychological problems encountered by patients that can help achieve success in areas requiring deliberate effort, such as verbal communication skills. This can be reflected in the improvement of competence scores, prevention of depression, and psychological development.

A similar finding was reported by Wolinsky *et al.* [57], who found that cognitive training affected the

cognitive ability targeted by the training and that these effects would last over time. Maintaining cognitive improvements would also lead to positive transfer effects on everyday life. This study was, however, in conflict with the research of Lincoln and Flannaghan [58], who reported no significant difference between people with strokes using CBT, the attention placebo, and standard care. Numerous explanations were put forward to explain why the intervention was not successful. The authors reported the brevity of the CBT relative to other studies, therapist training, sample size, recruitment strategy, and selection criteria. A further reason for the failure may be identified in the revelation, via post hoc analysis, that those who benefited least had poorer communication skills.

### The Main Effect of Gender on the Verbal Communication Skills of Persons with AOS

The findings of this study showed no significant main effect of gender on the verbal communication skills of persons with AOS. It implies that there is no significant difference in the mean scores of the verbal communication skills of persons with AOS relating to their gender. This aligns with the study of Kertesz and McCabe [59], who found that the gender of participants with AOS had nothing to do with their recovery. This finding negates that of Basso *et al.* [60], who demonstrated sex differences in the recovery mode and found that females improved significantly more than males in verbal expression and communication, although not in auditory comprehension. A similar finding was reported by Mantovani-Nagaoka and Ortiz [61], who reported that no differences in performance were observed for any of the subtests in the battery between men and women.

A study of other primates suggests that gender differences in human communication and language skills result from our hereditary biological and evolutionary differences in social tendencies [62]. Despite this, it is crucial to note that differences in human verbal performance are relatively subtle, with variable results across verbal tasks and ages [63]. Although differences in language development might be a by-product of differences in the development of the overall social communication system, sex differences in early language and speech abilities have been broadly studied [65]. A recent systematic literature review confirmed the existence of sex differences but also pointed out that they were limited and often interacted with various factors, such as age and task [64]. This may explain the present study's insignificant difference.

### **The Main Effect of Age on the Verbal Communication Skills of Persons with AOS**

This study reveals that there is no main significant effect of age on verbal communication skills. This implies that the mean scores of participants are not statistically different from each other regardless of age. The study provides some preliminary clinical guidelines for clinicians as it compares two active treatment conditions using a quasi-experimental research design, which is rare for CBT and MIT studies. Hence, based on this study, there is evidence that the two treatments were significant. AOS patients may benefit equally from both treatments in terms of improving their verbal communication skills. The present study provides the first group evidence that CBT and MIT are effective for verbal communication among persons with AOS. It also provides no significant differences in age associated with the therapy adoption. Additionally, this study provides evidence of CBT and MIT's effectiveness at the group level, a finding previously reported in a single-case experimental design study [66]. Participants' verbal communication skills were limited in the study design. A hearing screen was required to determine whether a participant had AOS before participating in the study. This requirement could have mitigated any presbycusis present in other studies.

### **CONCLUSION AND RECOMMENDATIONS**

Speech and language deficits associated with AOS can be properly managed with the help of a speech and language pathologist. Structural and neurological defects associated with a speech disorder might be

managed, but the psychological impacts which are not easily discernable are to be recognised by the speech and language pathologist as the first step towards total rehabilitation. Research evidence has continuously shown that early intervention and adoption of evidence-based practices are usually a better and quicker means towards managing the condition. The study, having determined the effect of CBT and MIT on persons with AOS, confirmed their potency as restorative tools for managing AOS. Therefore, it is important that speech and language therapists and other allied experts adopt these tools for the management of AOS. It is important that experts and professionals, such as speech and language pathologists, special educators, and physicians, should unanimously see the use of the treatment option. It is also important to note that family members and caregivers are the most important resource person and professionals in the quest to manage and rehabilitate persons with AOS. The multidisciplinary team should carry the family members along in all treatment options.

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### **CONFLICT OF INTEREST**

The authors confirm that there is no conflict of interest with respect to the data presented in this paper.

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