

# Real Speech pro

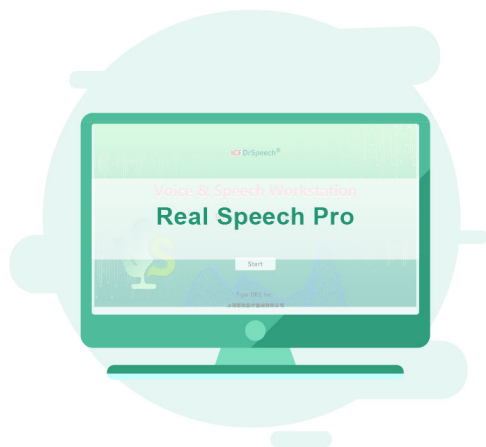


## *Function*

Assessment and therapy for speech, voice, and laryngeal disorders.

## *Target*

To address communication challenges caused by speech and voice disorders.



An all-in-one solution for speech disorders, combining precise assessment with effective therapy

### Assessment

Delivers real-time, objective assessments across key speech functions, helping clinicians identify challenges in respiration, phonation, resonance, articulation, and prosody.

- Real-Time Respiration Assessment
- Real-Time Phonation Assessment
- Real-Time Resonance Assessment
- Real-Time Articulation Assessment
- Real-Time Prosody Assessment

### Therapy

Provides interactive, personalized training programs with real-time audiovisual biofeedback to strengthen speech, language, and communication skills.

- Real-Time Respiration Biofeedback Training
- Real-Time Phonation Biofeedback Training
- Real-Time Resonance Biofeedback Training
- Real-Time Prosody Biofeedback Training

## ICF Speech and Voice Function Assessment

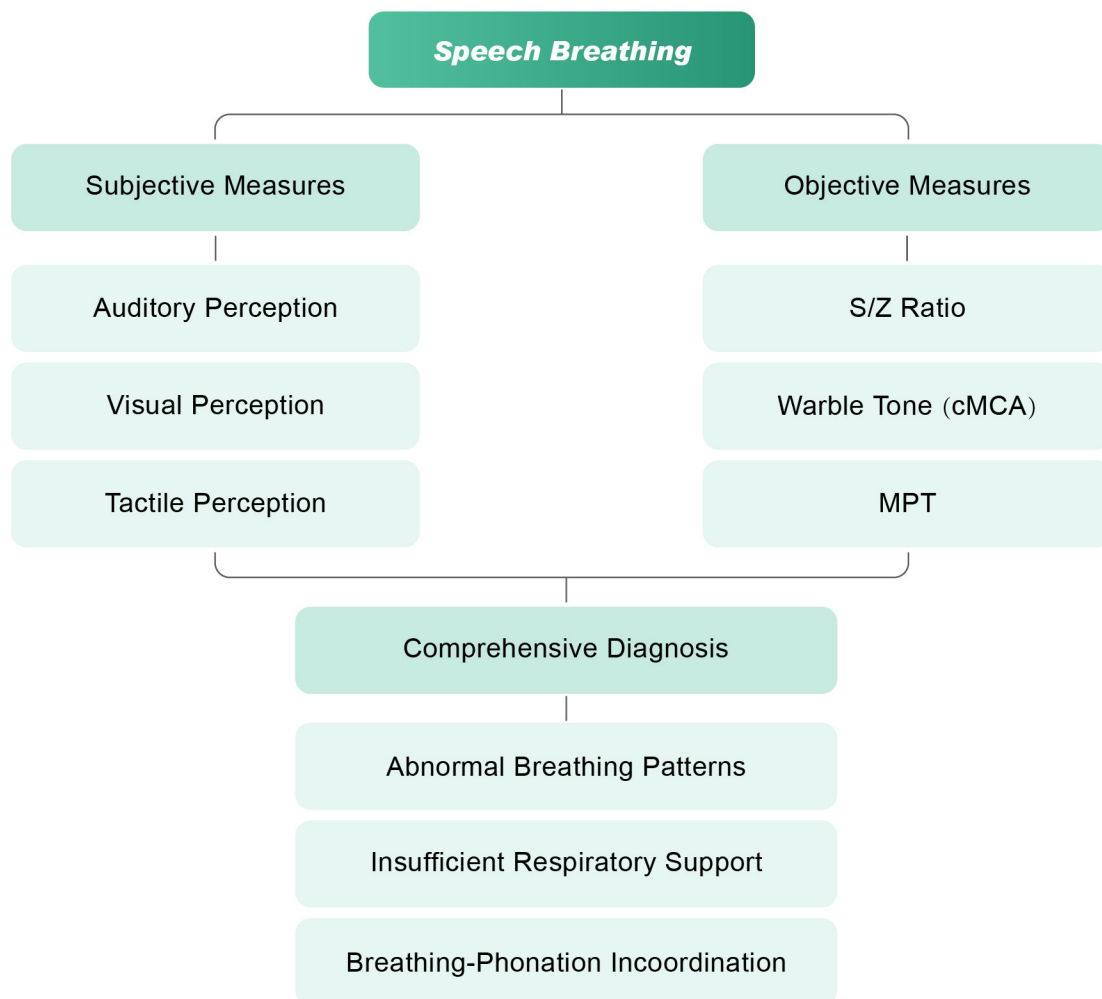
| Body Function = Degree of Impairment of Physiological Functions                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                                                                                                                                               | None                     | Mild                     | Moderate                            | Severe                              | Complete                            | Unspecified              | N/A                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|--------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                                                                                                                                               | 0                        | 1                        | 2                                   | 3                                   | 4                                   | 8                        | 9                        |
| b3100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Voice Production | Maximum Phonation Time (MPT)                                                                                                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  | Speech Fundamental Frequency (Fo)                                                                                                             | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  | Warble Tone (cMCA), Energy Concentration (Ec), Fundamental Frequency Tremor (Fot), Contact Quotient (CQ), Contact Quotient Perturbation (CQP) |                          |                          |                                     |                                     |                                     |                          |                          |
| Problem Description:<br>1. Sustained phonation: 4 seconds (norm ≥ 8.6s for age 4).<br>• Respiratory support is severely impaired.<br>• Further detail: The minimum requirement for maximum phonation time (MPT) is 8.6 seconds.<br>• Training recommendation: Real-time biofeedback therapy combined with traditional methods, such as relaxation breathing, rapid forceful breathing, or slow controlled breathing techniques, to promote improvement. (See detailed therapy protocol with speech-bridge device). |                  |                                                                                                                                               |                          |                          |                                     |                                     |                                     |                          |                          |
| b3101                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Voice Quality    | Jitter                                                                                                                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  | NNE                                                                                                                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  | Shimmer                                                                                                                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> |

Based on standardized protocols and evidence-based benchmarks, providing comprehensive assessment of speech, voice, and laryngeal function with targeted rehabilitation guidance.

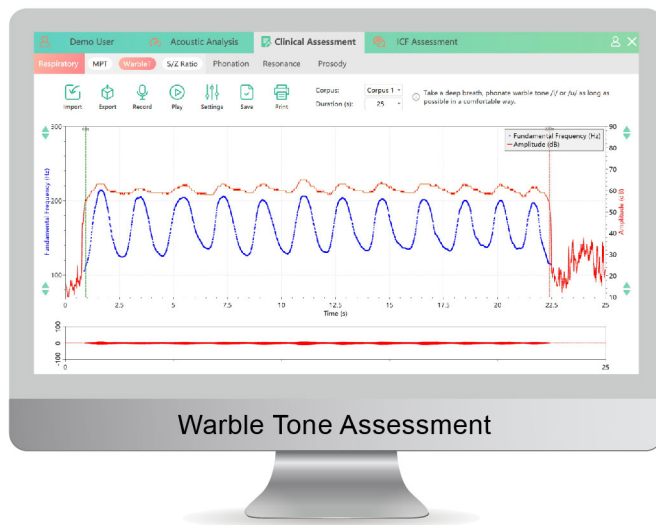
## Assessment

### ✓ Real-Time Speech Breathing Function Assessment:

- Supports measurements of MPT, Warble Tone (cMCA), and S/Z ratio.



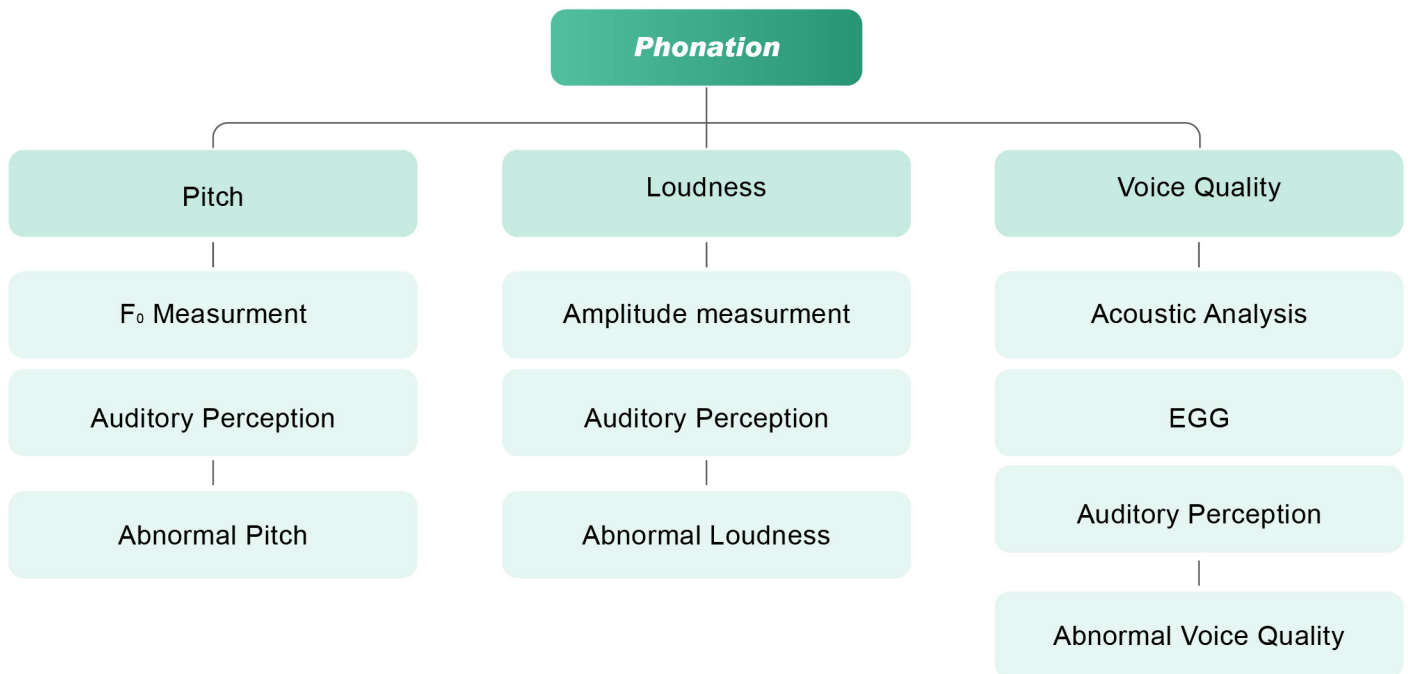
MPT 17.8 s



Warble Tone 21.4 s

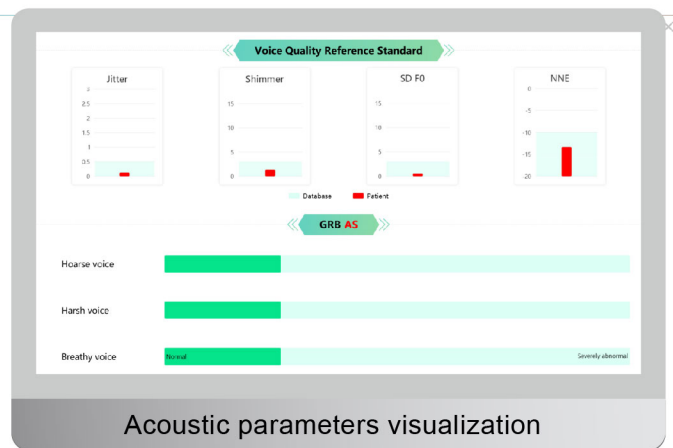
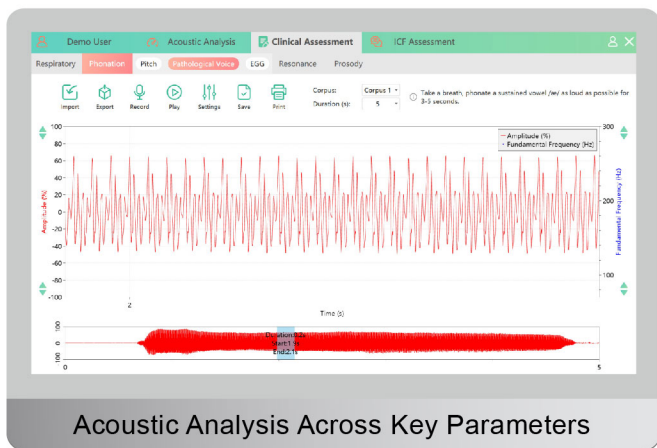
### ✓ **Real-Time Phonation Assessment:**

- Supports measurement of fundamental frequency ( $F_0$ ), pathological voice parameters, cepstral analysis, and electroglottography (EGG).

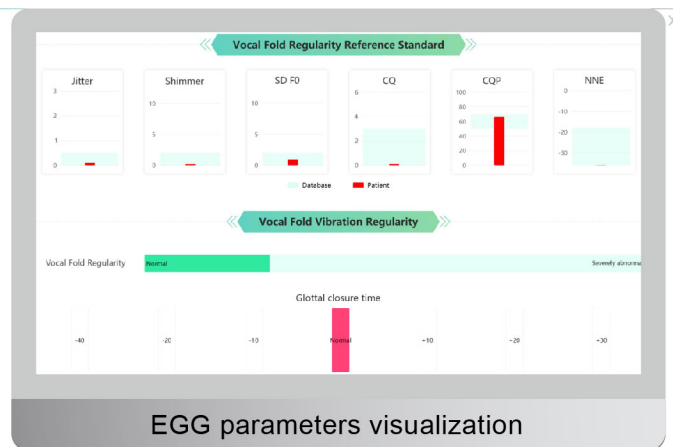
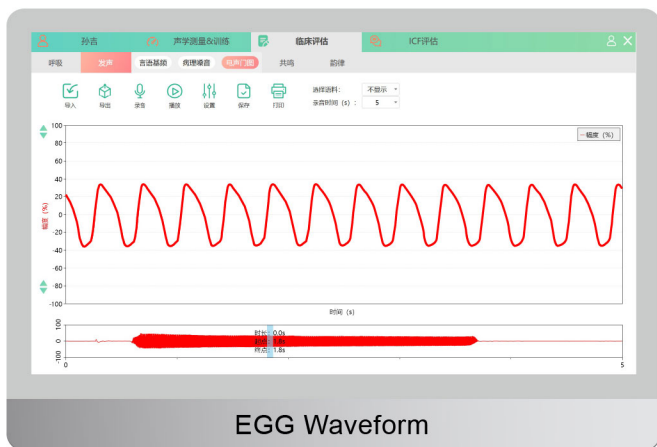


Fundamental Frequency ( $F_0$ )  
164 Hz





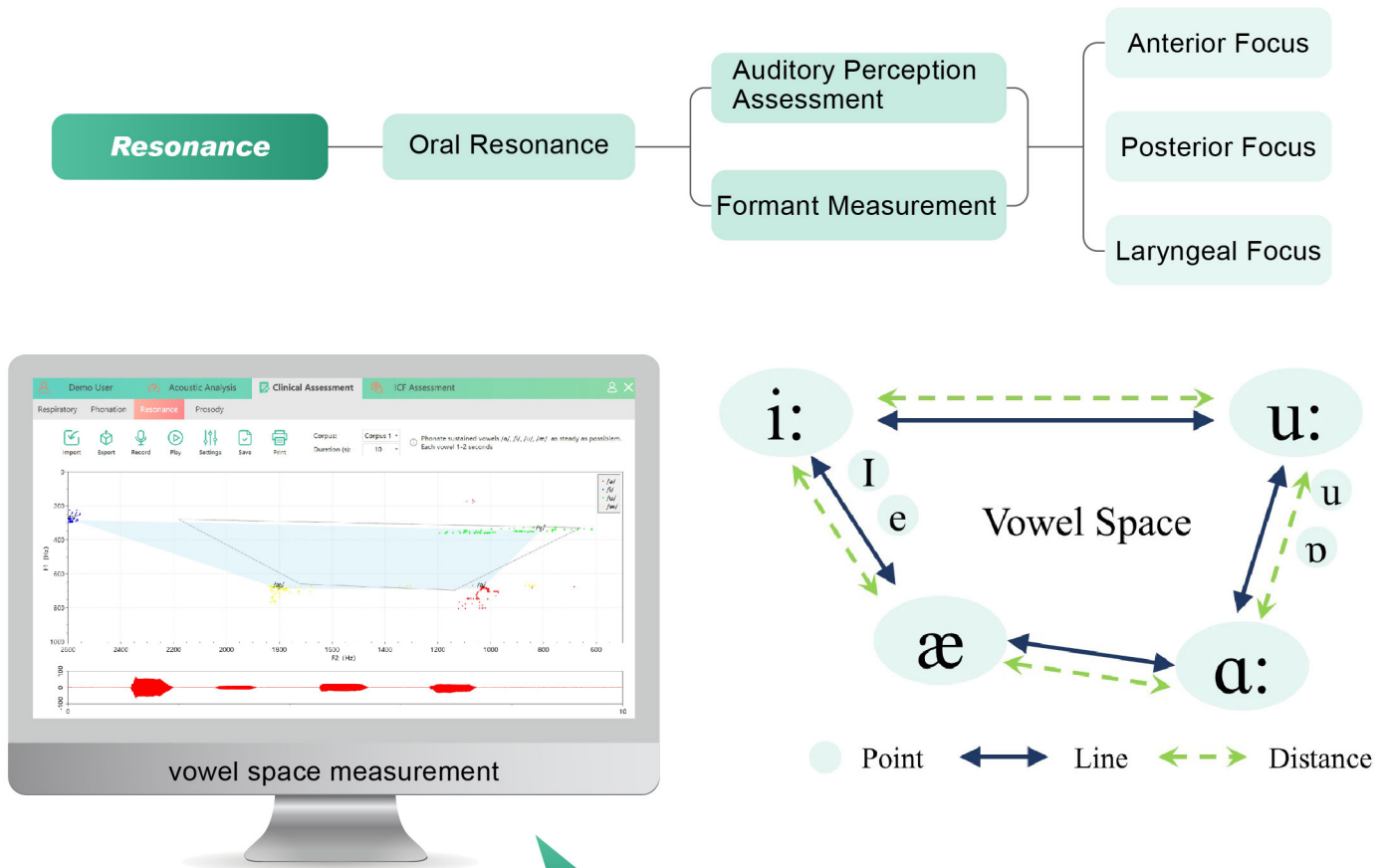
|              |          |                                    |         |      |          |
|--------------|----------|------------------------------------|---------|------|----------|
| Jitter (PPQ) | 0.23 %   | Fundamental Frequency Tremor (Fot) | 13.2 Hz | SNR  | 26.16 dB |
| NNE          | -16.2 dB | Energy Concentration (Ec)          | 46 %    | CPPs | 16.66 dB |
| HNR          | 27.28 dB | Shimmer (APQ)                      | 1.06%   |      |          |



|                       |        |                                     |       |         |          |
|-----------------------|--------|-------------------------------------|-------|---------|----------|
| Contact Quotient (CQ) | 69.8%  | Contact Quotient Perturbation (CQP) | -0.1% | EGG-HNR | 26.16 dB |
| Contact Index (CI)    | - 0.08 | Contact Index Perturbation (CIP)    | 6%    | EGG-SNR | 40.12 dB |
| EGG Shimmer (APQ)     | 0.21%  | EGG Jitter (PPQ)                    | 0.14% |         |          |

## ✓ Real-Time Resonance Assessment

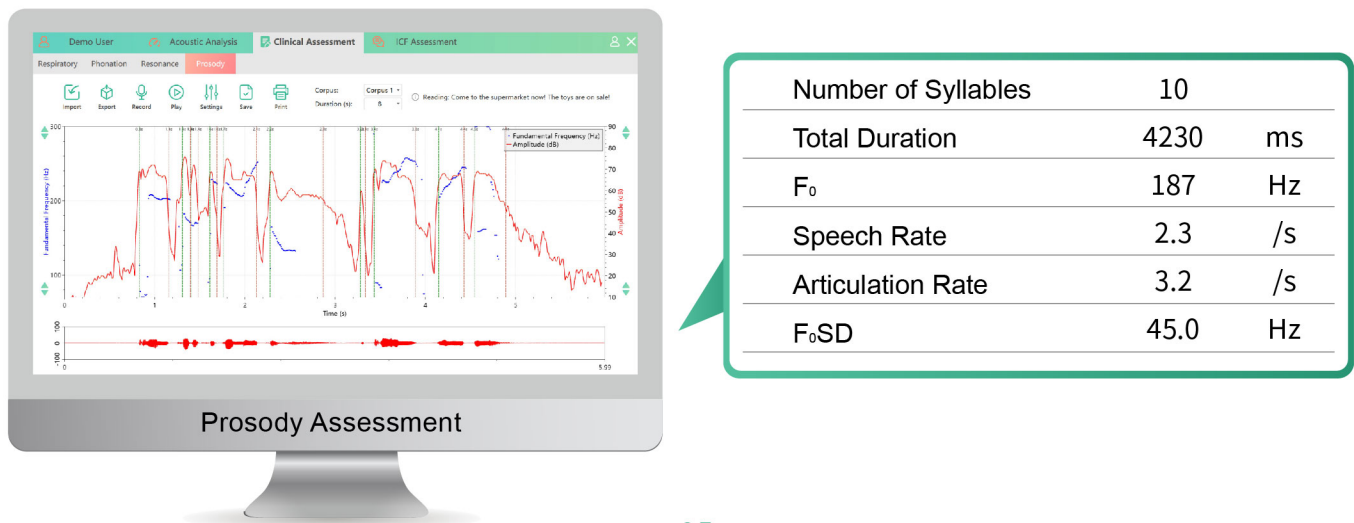
- Supports measurement of speech formants with Linear Predictive Coding (LPC) and resonance focus mapping, including formant analysis and formant space diagrams.



|                    |                        |                    |         |                    |        |                    |         |
|--------------------|------------------------|--------------------|---------|--------------------|--------|--------------------|---------|
| F <sub>1</sub> /a/ | 687 Hz                 | F <sub>1</sub> /i/ | 283 Hz  | F <sub>1</sub> /u/ | 347 Hz | F <sub>1</sub> /æ/ | 687 Hz  |
| F <sub>2</sub> /a/ | 1035 Hz                | F <sub>2</sub> /i/ | 2583 Hz | F <sub>2</sub> /u/ | 811 Hz | F <sub>2</sub> /æ/ | 1802 Hz |
| VSA                | 178018 Hz <sup>2</sup> | VSA Ratio          | 1.01    | FCR                | 0.75   | VAI                | 1.32    |

## ✓ Real-Time Prosody Assessment:

- Conducting measurement and analysis of prosodic parameters, including speech rate, articulation rate, and standard deviation of fundamental frequency (F<sub>0</sub>SD).

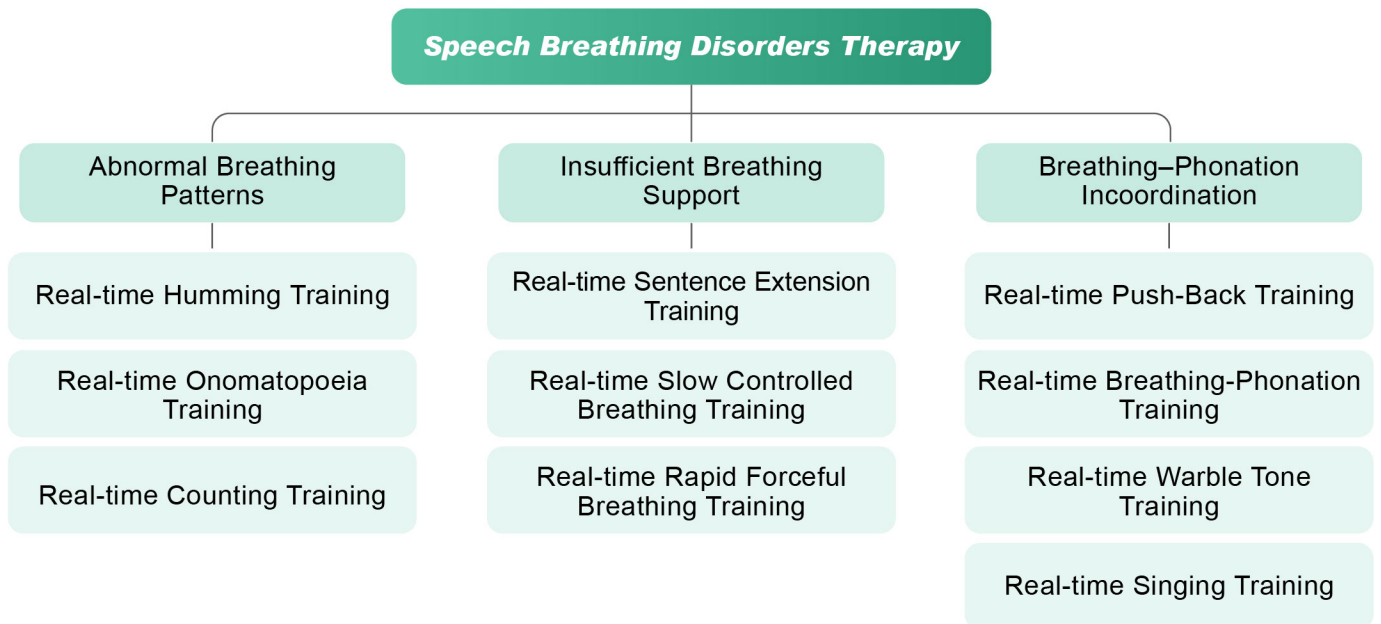


## Treatment

Using real-time audiovisual feedback combined with facilitative therapy techniques, this system provides targeted intervention for disorders of the respiration, phonation, and resonance systems involved in speech. The system emphasizes voice and speech therapy as a foundation to improve overall speech intelligibility.

| Key Parameters               | Description                                                                                                                                |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Waveform                     | Time-domain representation of the speech signal showing amplitude changes over time.                                                       |
| Voiced & Unvoiced            | Classification of speech segments based on the presence (voiced) or absence (unvoiced) of vocal fold vibration.                            |
| F <sub>0</sub>               | The primary frequency of vocal fold vibration, corresponding to perceived pitch.                                                           |
| Amplitude                    | The magnitude of the acoustic signal, corresponding to perceived loudness.                                                                 |
| F <sub>0</sub> and Amplitude | Simultaneous display of pitch and intensity contours across an utterance.                                                                  |
| Spectrogram                  | Frequency-domain display of speech showing time, frequency, and intensity, used to visualize speech dynamics.                              |
| Formants (LPC)               | Resonant frequencies of the vocal tract estimated using Linear Predictive Coding, critical for vowel identification and speech clarity.    |
| Cepstrum                     | An acoustic analysis that captures both periodic and aperiodic components of the voice signal, used to assess voice quality and stability. |

### ✓ Real-Time Speech Breathing Biofeedback Training

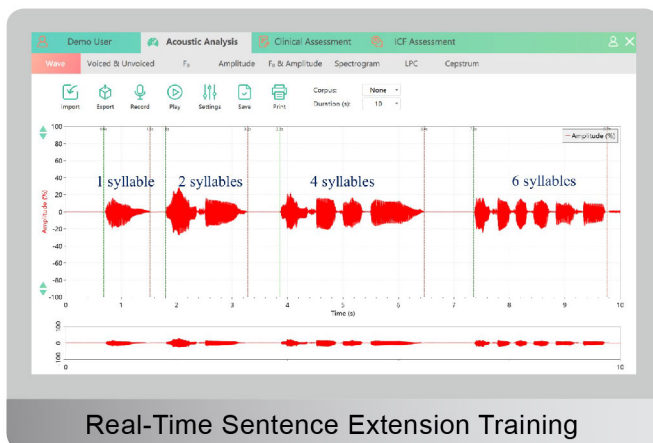


## • **Insufficient Respiratory Support**

Therapy focuses on strengthening breath support through rapid forceful breathing, slow controlled breathing, and sentence-length extension, supported by real-time audiovisual feedback to improve breath–voice coordination and carryover into speech.



| No.                       | 1          | 2          | 3          | 4          |
|---------------------------|------------|------------|------------|------------|
| <b>Duration (s)</b>       | <b>0.7</b> | <b>0.8</b> | <b>0.7</b> | <b>0.8</b> |
| F <sub>0</sub> Avg (Hz)   | 141        | 129        | 137        | 140        |
| F <sub>0</sub> SD (Hz)    | 26.8       | 35.4       | 29.9       | 33.2       |
| <b>Amplitude Avg (dB)</b> | <b>58</b>  | <b>61</b>  | <b>62</b>  | <b>59</b>  |
| Amplitude SD (dB)         | 9.9        | 11.2       | 11.0       | 13.7       |
| F <sub>1</sub> (Hz)       | 152        | 152        | 147        | 210        |
| F <sub>2</sub> (Hz)       | 527        | 726        | 703        | 714        |
| F <sub>3</sub> (Hz)       | 644        | 1042       | 936        | 1031       |



| No.                     | 1          | 2          | 3          | 4          |
|-------------------------|------------|------------|------------|------------|
| <b>Duration (s)</b>     | <b>0.5</b> | <b>1.2</b> | <b>1.6</b> | <b>2.0</b> |
| F <sub>0</sub> Avg (Hz) | 133        | 147        | 135        | 151        |
| F <sub>0</sub> SD (Hz)  | 17.7       | 19.4       | 23.7       | 15.6       |
| Amplitude Avg (dB)      | 68         | 65         | 61         | 64         |
| Amplitude SD (dB)       | 12.5       | 11.7       | 11.7       | 5.5        |
| F <sub>1</sub> (Hz)     | 236        | 269        | 316        | 257        |
| F <sub>2</sub> (Hz)     | 431        | 474        | 571        | 386        |
| F <sub>3</sub> (Hz)     | 857        | 760        | 867        | 636        |

## • Breathing-Phonation Incoordination

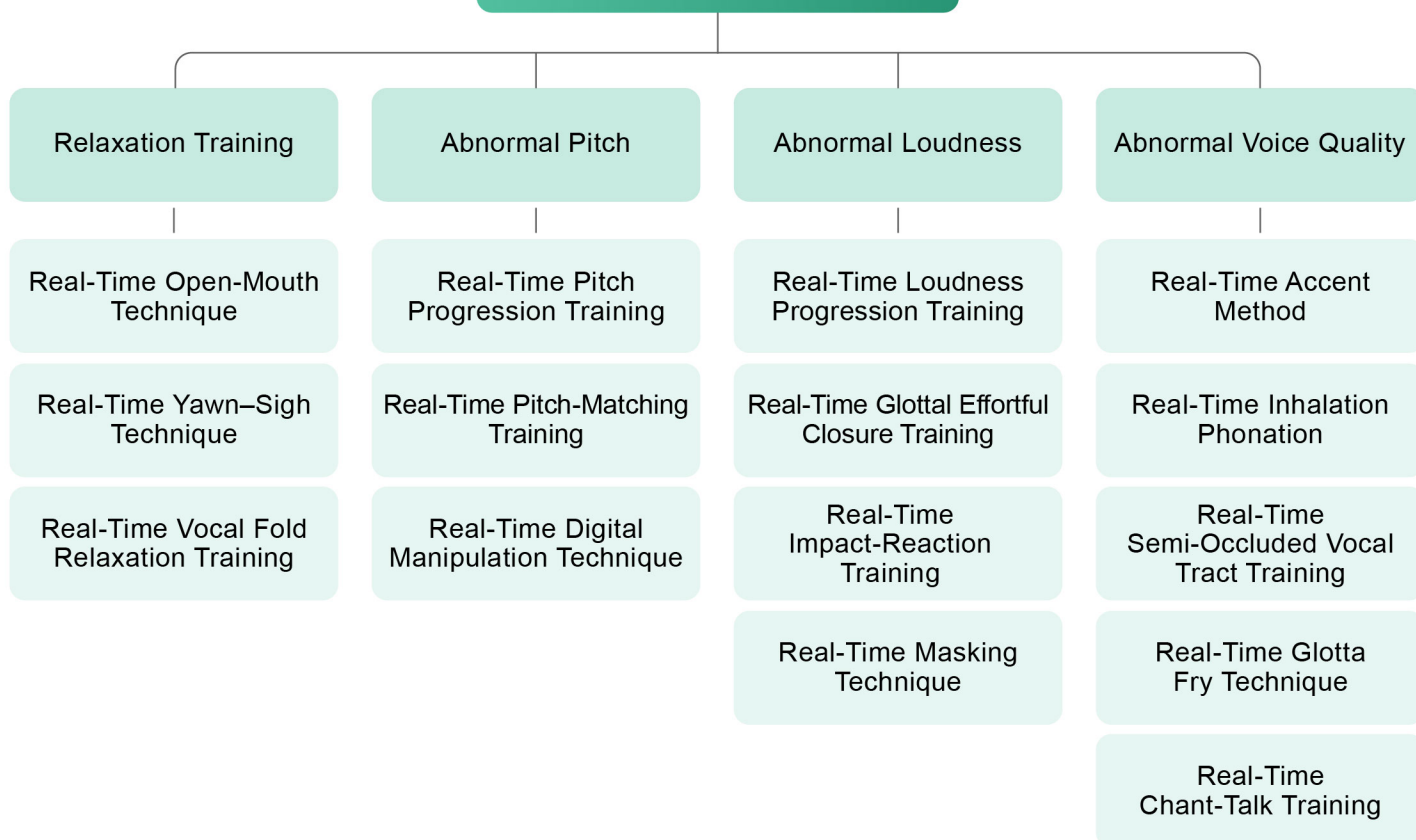
Therapy focuses on using chanting, humming/warble, breathy onset, and the push-back technique, supported by real-time audiovisual feedback to improve coordination and carryover into speech.



| No.                           | 1          | 2          | 3          |
|-------------------------------|------------|------------|------------|
| <b>Duration (s)</b>           | <b>0.9</b> | <b>3.3</b> | <b>0.8</b> |
| <b>F<sub>0</sub> Avg (Hz)</b> | <b>136</b> | <b>170</b> | <b>148</b> |
| F <sub>0</sub> SD (Hz)        | 17.3       | 13.2       | 23.7       |
| Amplitude Avg (dB)            | 58         | 62         | 61         |
| Amplitude SD (dB)             | 12.1       | 12.7       | 10.7       |
| F <sub>1</sub> (Hz)           | 316        | 269        | 316        |
| F <sub>2</sub> (Hz)           | 632        | 644        | 667        |
| F <sub>3</sub> (Hz)           | 1157       | 960        | 867        |

## ✓ Real-Time Phonation Biofeedback Training

### Dysphonia Therapy



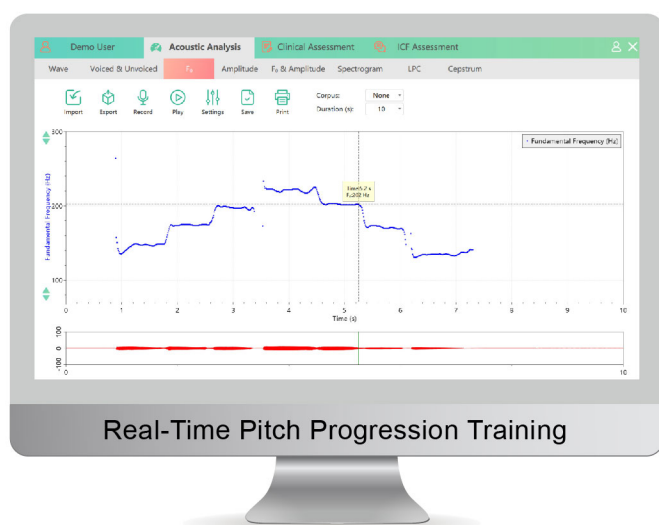


## • Abnormal Pitch

Treatment for pitch disorders includes digital laryngeal techniques, pitch-matching exercises, and pitch progression practice, supported by real-time audiovisual feedback.



| No.                           | 1          | 2          | 3          | 4          |
|-------------------------------|------------|------------|------------|------------|
| Duration (s)                  | 0.9        | 1.0        | 1.3        | 1.3        |
| <b>F<sub>0</sub> Avg (Hz)</b> | <b>106</b> | <b>138</b> | <b>175</b> | <b>216</b> |
| <b>F<sub>0</sub> SD (Hz)</b>  | <b>1.2</b> | <b>1.7</b> | <b>4.4</b> | <b>9.3</b> |
| Amplitude Avg (dB)            | 62         | 64         | 66         | 72         |
| Amplitude SD (dB)             | 1.1        | 8.2        | 9.1        | 7.1        |
| F <sub>1</sub> (Hz)           | 609        | 609        | 199        | 234        |
| F <sub>2</sub> (Hz)           | 996        | 1066       | 679        | 644        |
| F <sub>3</sub> (Hz)           | 2765       | 2835       | 1066       | 1101       |



| No.                           | 1           |
|-------------------------------|-------------|
| Duration (s)                  | 7.8         |
| <b>F<sub>0</sub> Avg (Hz)</b> | <b>156</b>  |
| <b>F<sub>0</sub> SD (Hz)</b>  | <b>28.7</b> |
| Amplitude Avg (dB)            | 63          |
| Amplitude SD (dB)             | 8.2         |
| F <sub>1</sub> (Hz)           | 222         |
| F <sub>2</sub> (Hz)           | 351         |
| F <sub>3</sub> (Hz)           | 433         |



## • Abnormal Loudness

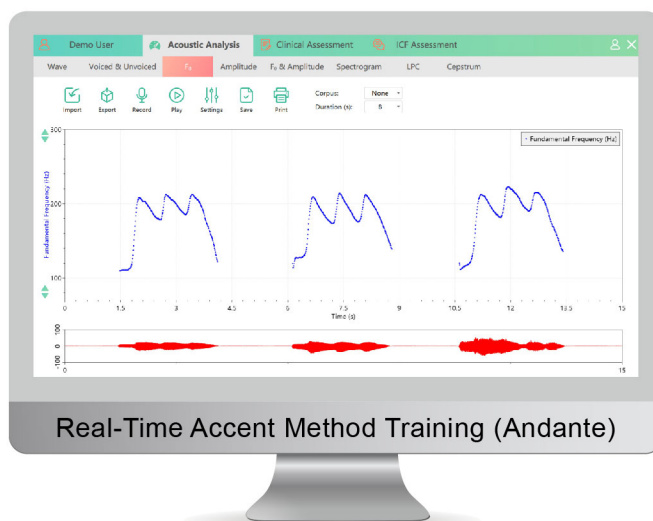
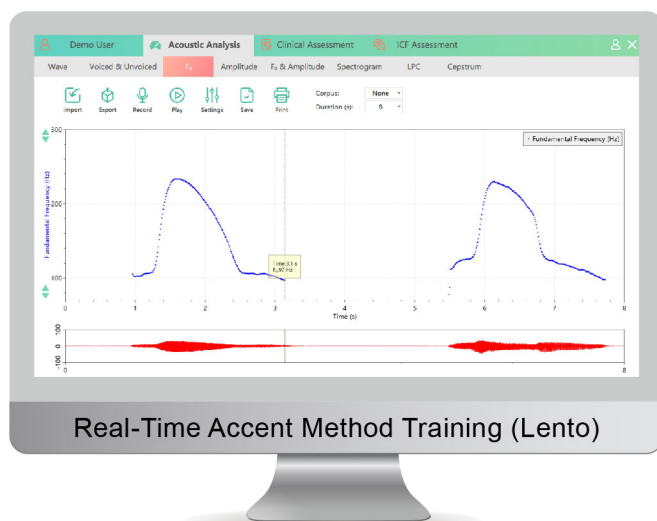
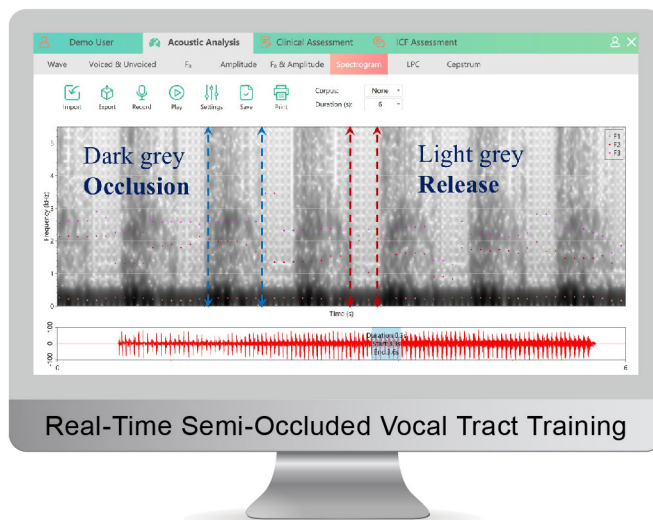
Treatment for loudness disorders includes, masking, impact-reaction exercises, effortful closure, and loudness progression, supported by real-time audiovisual feedback.



| No.                       | 1         | 2         | 3         | 4         |
|---------------------------|-----------|-----------|-----------|-----------|
| Duration (s)              | 0.4       | 0.6       | 0.7       | 0.8       |
| F <sub>0</sub> Avg (Hz)   | 121       | 133       | 187       | 244       |
| F <sub>0</sub> SD (Hz)    | 0.2       | 0.7       | 2.6       | 7.4       |
| <b>Amplitude Avg (dB)</b> | <b>38</b> | <b>49</b> | <b>65</b> | <b>77</b> |
| Amplitude SD (dB)         | 9.0       | 11.3      | 11.3      | 11.5      |
| F <sub>1</sub> (Hz)       | 738       | 632       | 738       | 878       |
| F <sub>2</sub> (Hz)       | 1230      | 1054      | 1148      | 1230      |
| F <sub>3</sub> (Hz)       | 2519      | 2113      | 2625      | 2519      |

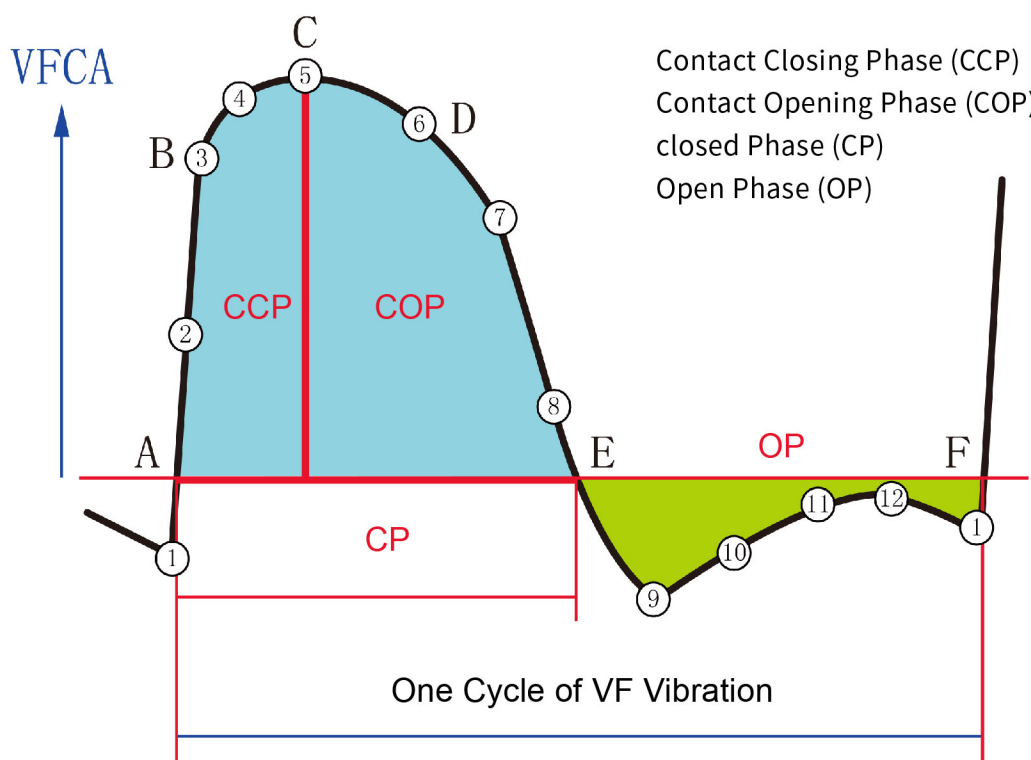
## • Abnormal Voice Quality

Treatment for voice quality disorders includes laryngeal massage, the chewing technique, chant-talk, glottal fry, semi-occluded vocal tract exercises, inhalation phonation, resonant voice therapy, and the accent method, all supported by real-time audiovisual feedback.

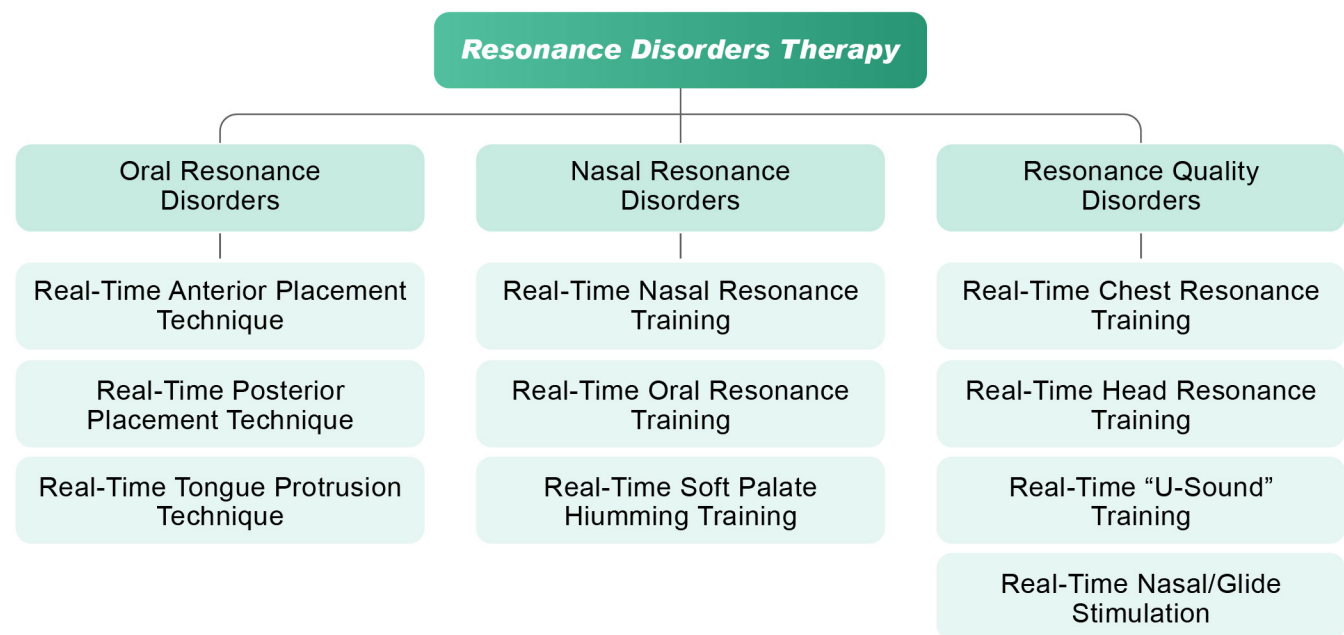


## Speech-EGG Therapy

- ✓ Conduct laryngeal function (vocal cords) speech rate and intonation training based on parameters such as fundamental frequency and duration.
- ✓ Conduct laryngeal function (glottis) closure movement and swallowing movement training based on parameters such as CQ and NNE.
- ✓ During the swallowing process, the larynx will rise, the glottis will close, and then the larynx will descend. The electroglottograph can indirectly reflect the information of laryngeal elevation and descent, swallowing safety, and swallowing reflex.
- ✓ In articulation and phonological training, observe whether there are changes in the vocal cord closure pattern when pronouncing velar consonants, such as stronger closure or longer closure time.

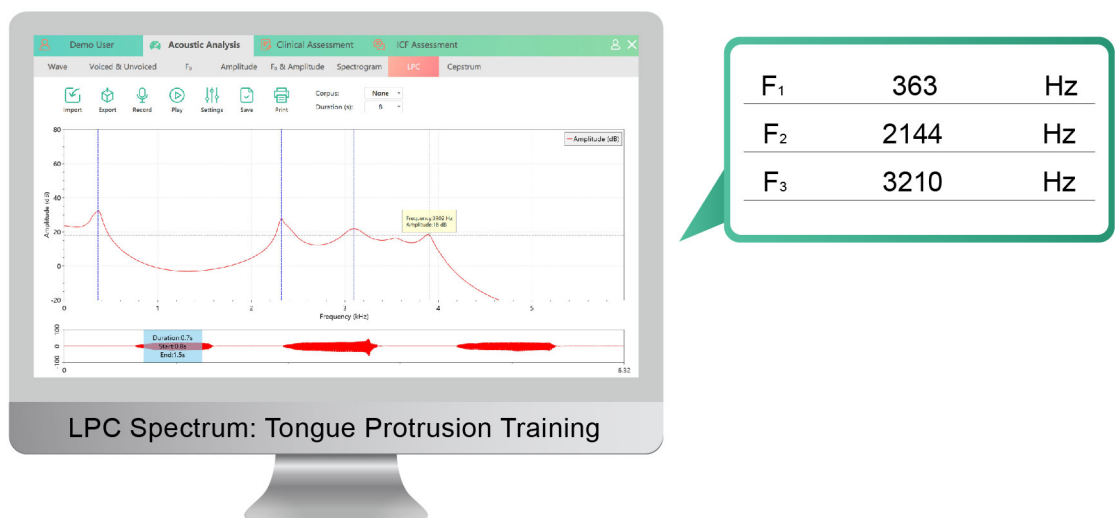


✓ **Real-Time Resonance Biofeedback Training**



• **Oral Resonance Disorders**

Treatment for oral resonance disorders includes the tongue protrusion technique, posterior placement, and anterior placement, supported by real-time audiovisual feedback.



## • Nasal Resonance Disorders

Treatment for nasal resonance disorders includes soft palate training, oral resonance exercises, and nasal resonance exercises, supported by real-time audiovisual feedback.

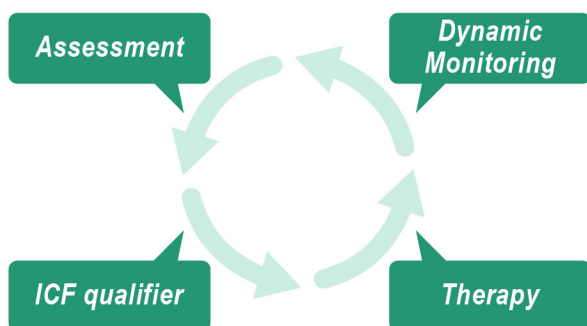


## • Resonance Quality Disorders

Treatment for resonance quality disorders includes nasal/glide stimulation, head resonance exercises, chest resonance exercises, and the U-sound technique, supported by real-time audiovisual feedback.



## Integrated Speech and Voice Therapy Pathway



The process begins with Diagnosis, followed by an ICF-based Assessment to identify functional impairments. A tailored Therapy Program is then implemented, with Dynamic Assessment and Monitoring ensuring continuous progress tracking and therapy refinement.

## ICF Speech and Voice Function Assessment

An ICF-based speech and voice function evaluation report can be generated from clinical assessment parameters, with impairment levels classified according to normative data and ICF standards.

The screenshot displays the 'ICF Assessment' software interface. At the top, there are tabs for 'Demo User', 'Acoustic Analysis', 'Clinical Assessment', and 'ICF Assessment'. Below these, a 'Short-term Monitoring' section contains buttons for 'All', 'MPT', 'WarbleT', 'Pitch', 'Pathological Voice', 'EGG', 'Resonance', and 'Prosody'. A 'Generate Report' button is highlighted with a blue arrow. The main area features a table with columns: Number, Date, Type, and Action. A blue arrow points to row 8, which is highlighted. To the right, a detailed view of the selected item shows various parameters and their values.

| Number                                 | Date                | Type                   | Action |
|----------------------------------------|---------------------|------------------------|--------|
| <input checked="" type="checkbox"/> 4  | 2025-08-22 13:55:38 | Resonance              |        |
| <input type="checkbox"/> 5             | 2025-08-22 12:58:25 | Resonance              |        |
| <input type="checkbox"/> 6             | 2025-08-22 12:54:38 | Pathological Voice     |        |
| <input type="checkbox"/> 7             | 2025-08-22 12:53:28 | Electroglottography    |        |
| <input checked="" type="checkbox"/> 8  | 2025-08-22 12:41:17 | Pathological Voice     |        |
| <input type="checkbox"/> 9             | 2025-08-22 12:27:45 | Pathological Voice     |        |
| <input checked="" type="checkbox"/> 10 | 2025-08-22 12:19:18 | Fundamental Frequency  |        |
| <input checked="" type="checkbox"/> 11 | 2025-08-21 21:19:57 | Warble Tone            |        |
| <input checked="" type="checkbox"/> 12 | 2025-08-21 21:18:44 | Maximum Phonation Time |        |
| <input type="checkbox"/> 13            | 2025-08-21 20:42:21 | Pathological Voice     |        |
| <input type="checkbox"/> 14            | 2025-08-21 20:39:44 | Maximum Phonation Time |        |

| Parameter      | Value                      | Unit     |
|----------------|----------------------------|----------|
| Maximum... ×   | MPT                        | 17.8 s   |
| Warble To... × | cMCA                       | 21.4 s   |
| Fundame... ×   | F <sub>0</sub>             | 164 Hz   |
|                | Jitter(PPQ)                | 0.14 %   |
|                | Pitch Tremor               | 1.0 Hz   |
| Pathologi... × | Shimmer(APQ)               | 2.10 %   |
|                | NNE                        | -18.1 dB |
|                | Ratio                      | 39.0 %   |
| Electrogl... × | CQ                         | 71.5 %   |
|                | CQP                        | 0.1 %    |
| Resonance ×    | Formant F <sub>1</sub> /i/ | 2562 Hz  |
|                | Formant F <sub>2</sub> /u/ | 673 Hz   |

### ICF-Based Speech, Language, and Cognitive Function Assessment Form

#### ICF Assessment Form Functional

Physical Function = Degree of physiological impairme...

|                           | No                         | Mild | Moderate | Severe | Complete | Unspecified | N/A |
|---------------------------|----------------------------|------|----------|--------|----------|-------------|-----|
|                           | 0                          | 1    | 2        | 3      | 4        | 8           | 9   |
| b3100 Production of Voice | MPT                        |      |          |        |          |             |     |
|                           | cMCA                       |      |          |        |          |             |     |
|                           | F <sub>0</sub>             |      |          |        |          |             |     |
|                           | EC                         |      |          |        |          |             |     |
|                           | F <sub>0</sub> t           |      |          |        |          |             |     |
|                           | CQ                         |      |          |        |          |             |     |
|                           | CQP                        |      |          |        |          |             |     |
| b3101 Quality of Voice    | Jitter                     |      |          |        |          |             |     |
|                           | NNE                        |      |          |        |          |             |     |
|                           | Shimmer                    |      |          |        |          |             |     |
|                           | Formant F <sub>2</sub> /u/ |      |          |        |          |             |     |

Export Print Save Back



## Dynamic assessment and therapy monitoring

- ✓ In speech and voice rehabilitation, regular assessments provide dynamic evaluation and continuous monitoring of therapy outcomes.

### Therapy monitoring of a High-Pitched Male Voice

| Date | F <sub>0</sub> |   | F <sub>0</sub> SD |   | Real Age | Development Age | Pitch Disorder | ICF                |   |
|------|----------------|---|-------------------|---|----------|-----------------|----------------|--------------------|---|
| 3.9  | 241            | ↑ | 28                | — | 29       | /               | Y              | Begin              | 2 |
|      |                |   |                   |   |          |                 |                | Target             | 0 |
| 3.14 | 192            | ↑ | 26                | — | 29       | /               | Y              | Dynamic Assessment | 2 |
| 3.20 | 163            | ↑ | 23                | — | 29       | /               | Y              |                    | 1 |
| 3.27 | 142            | — | 24                | — | 29       | /               | N              |                    | 0 |