

# Pharyngeal Motion Sensor for Muscle Movement Detection

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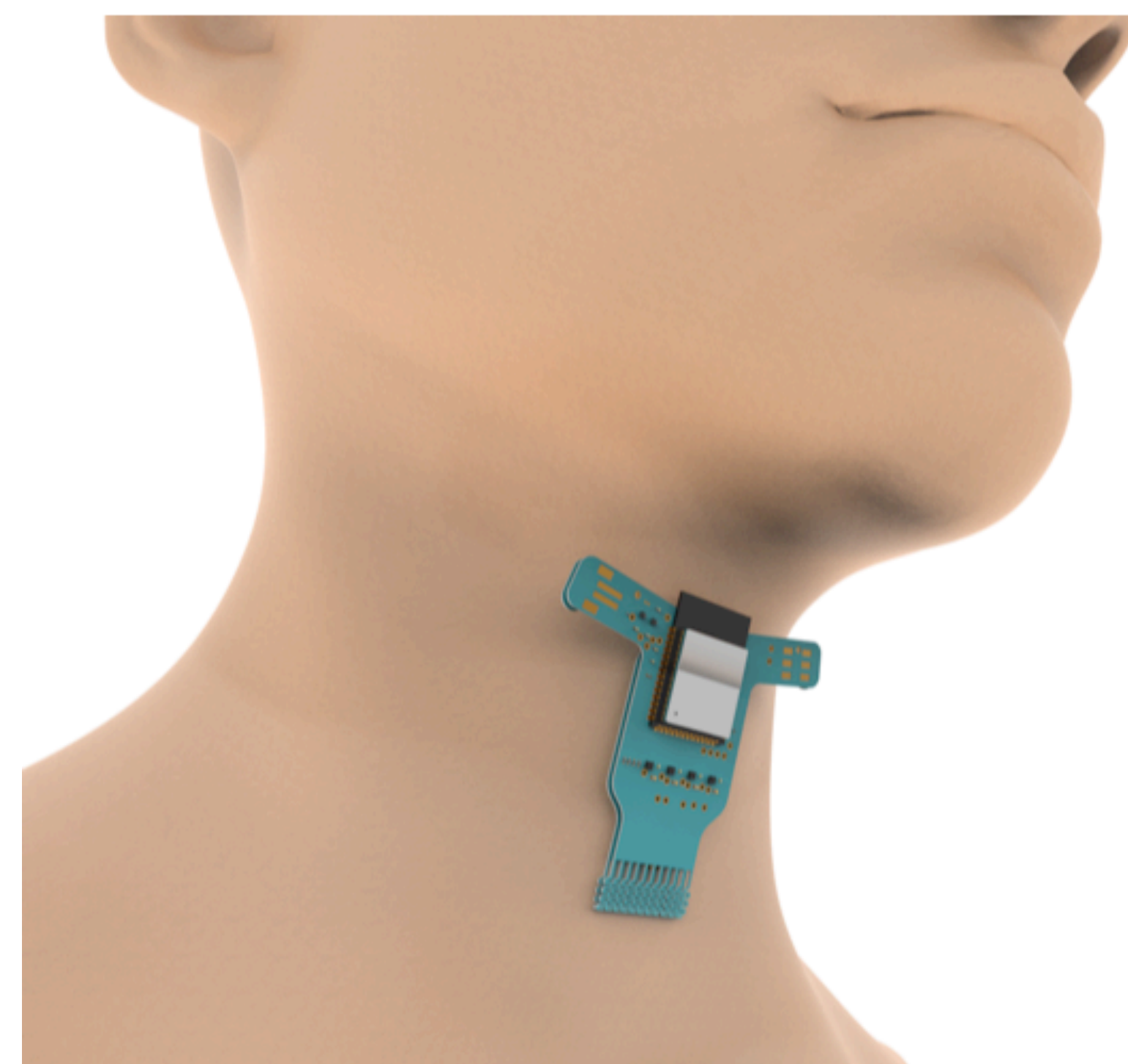
## Background

An estimated 17.9 million U.S. adults reported having had a problem with their voice in the past 12 months

Speech-related disorders can range from hoarse voice to partial loss of speech due to brain damage

Speech therapy helps those affected develop stronger verbal capabilities by training muscles used in speech

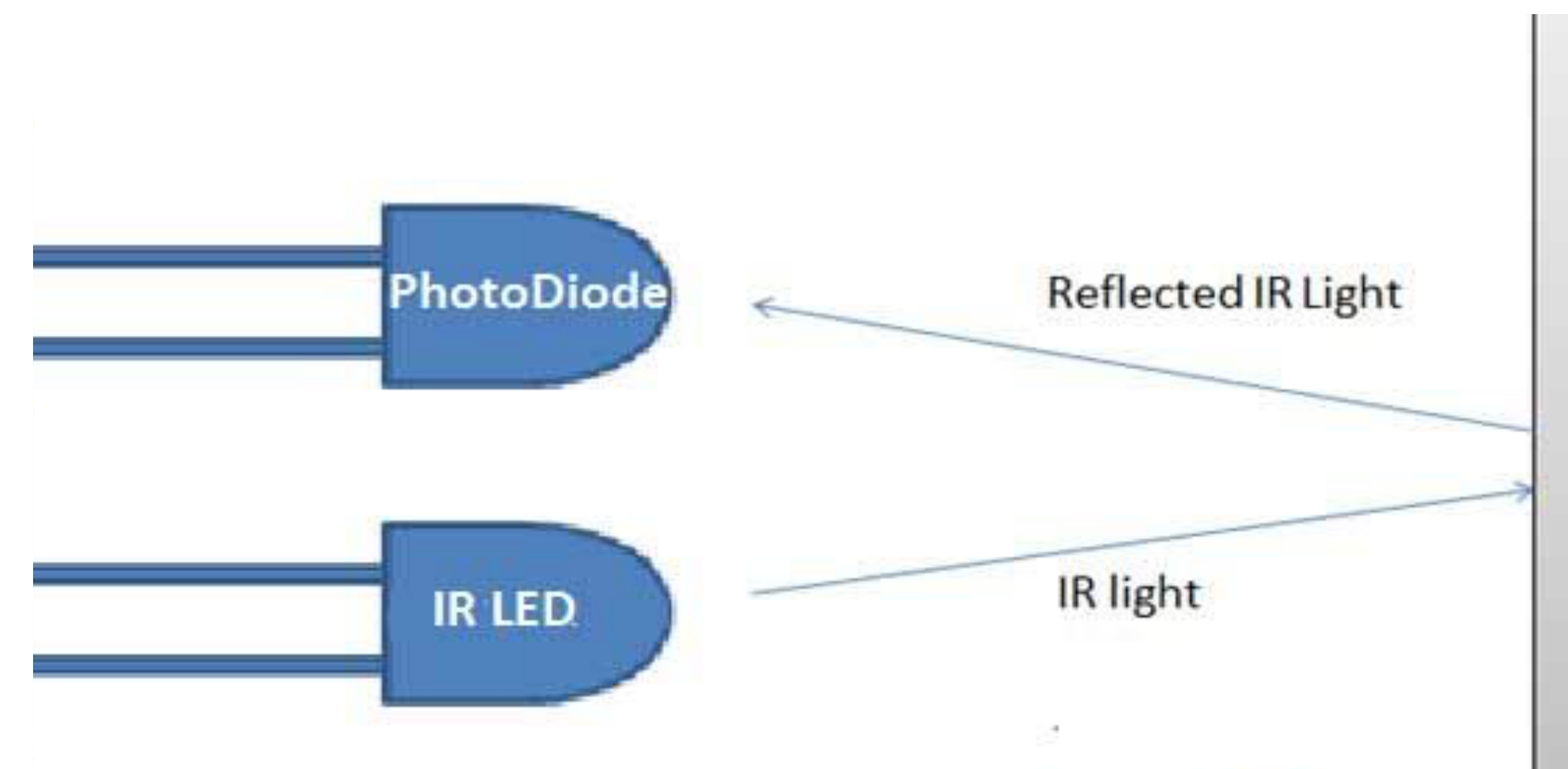
Speech therapists struggle with providing proper vocal training without understanding which muscles are affected



## Goals

The Pharyngeal Motion Sensor will aid in the identification of muscle movements during speech, allowing speech therapists to design practices or exercises that result in the strengthening of weak muscle groups, and or assign existing exercises to clients

## Design

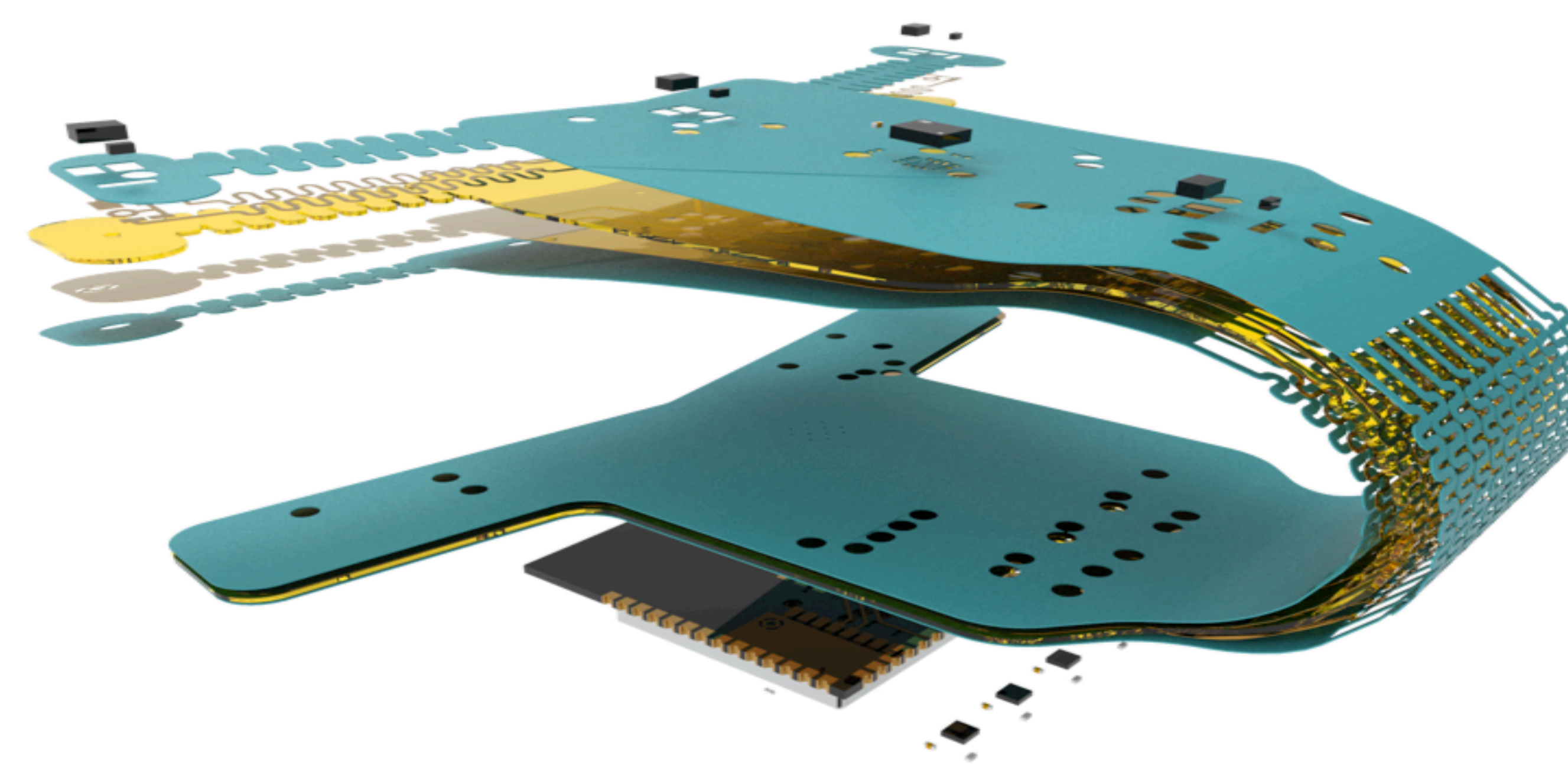


The sensor employs the principles of Infrared Spectroscopy to monitor muscle movement

The device utilizes Photodiodes and LED's to monitor motion of the pharyngeal muscles during speech exercises

The LED transmits IR light that can penetrate the skin to be reflected off of pharyngeal muscles in motion

The photodiodes are used to interpret the reflected off IR light and determine which muscles are in motion



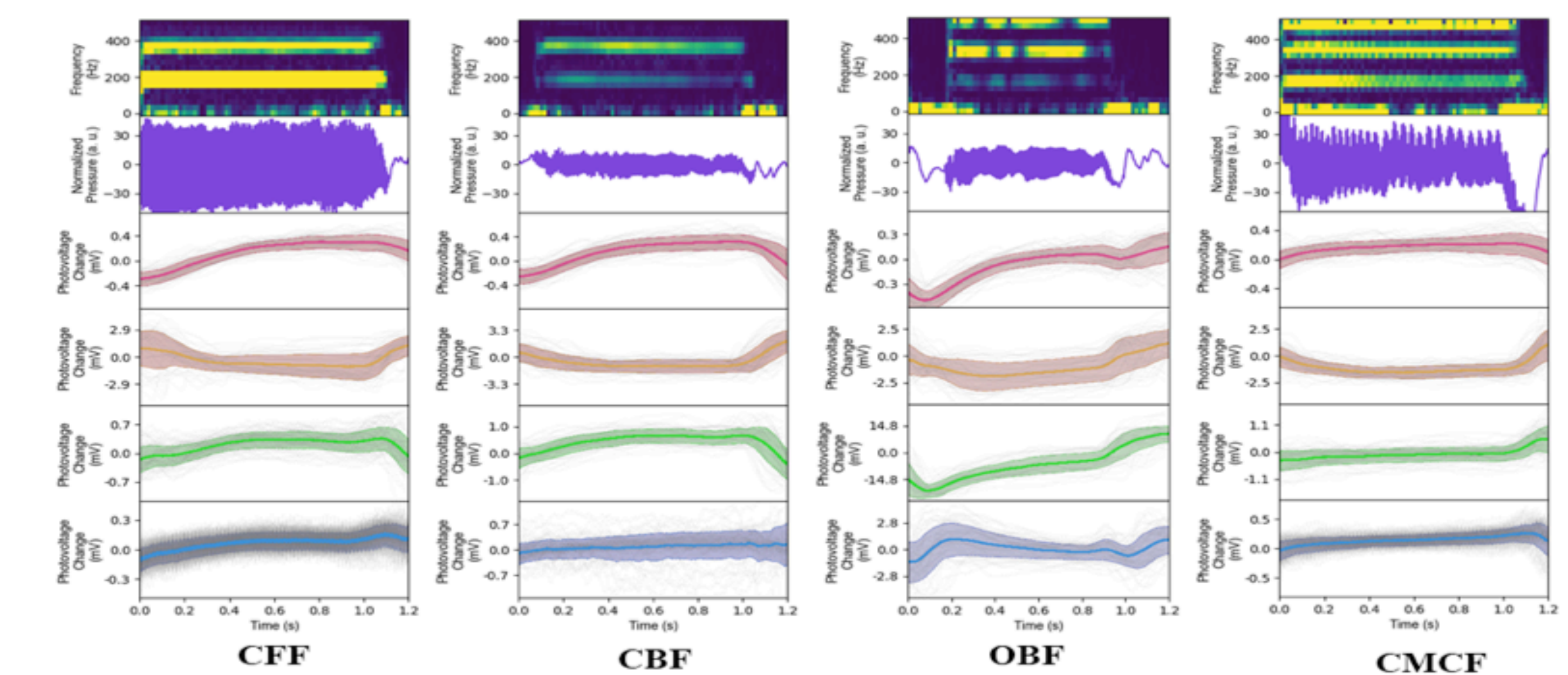
## In-Practice

Therapists employ the IPA(International-Phonetic Alphabet) in speech training

The IPA chart includes a specific symbol representing each sound of speech, allowing for proper identification of vocal deficiencies

THE INTERNATIONAL PHONETIC ALPHABET (revised to 2020)

CONSONANTS (PULMONIC)													© 2020 IPA	
	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal			
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ			
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ					
Trill										ʀ				
Tap or Flap				ɾ		ɽ								
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ			
Lateral fricative				ɬ ɮ										
Approximant				ɹ			ɻ	j	ɰ					
Lateral approximant				l		ɭ	ʎ	ʟ						



Therapists will use the Pharyngeal Motion Detector in conjunction with the IPA to diagnose specific muscle insufficiencies

Speech therapists can then design exercises that result in the strengthening of weak muscle groups

## References

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