

SUPPLEMENTARY MATERIAL 1

Descriptive information of patients in sessions

This study classified responses or changes that a patient showed during singing centering on songs the patient prefers, therapeutic vocalizations using simple melody and 'i-e-a-o-u' vowels and voice improvisation according to session into physical, vocal, and emotional responses by analyzing session video of the patient.

1. Patient A (F/62, PD duration for 8 years, home-based sessions)	
She had a symptom of depression and suffered from daily communication problems due to unclear articulation, delayed phonation and a hoarse voice with tremor.	
1st–2nd sessions	V Her ineffective inhale caused insecurity of vocalizing even though strong and loud voice. E She mentioned that "I could not sing comfortably due to trembling the upper body but it is such a pleasant feeling being able to sing."
3rd–4th sessions	V Her voice became much smother after adjusting the respiration patterns to the tremor of her upper body. E She actively enjoyed the egg shakers with the loud voice even though her upper body was trembling.
5th–6th sessions	V Due to the tremor of thin, humming and changing interval might have helped to reduce her tremor and to clear her voice. E She said that "I feel like I am doing something important. It is my song and how I live. Making my song and singing makes me truly happy with self-controlled voice and emotion even though my body is still a bit shaky."
2. Patient B (M/53, PD duration for 2 years)	
He had a severe swallowing problem, short breathing cycles during conversation, delayed speech, and low self-esteem. He had severe anxiety and depression due to the disease and the concerns of his life as well as a high-pitched and cracking voice.	
1st–2nd sessions	V He mentioned that "My voice is too soft and I cannot phonate more than 5 seconds to speak. I don't like my voice, and I also think that singing isn't something I can do." E He had negative memories about singing so that it was hard to express his thought and feeling.
3rd–4th sessions	V After expanded respiration vocalizing pattern, he said that "I feel like my throat is opening up and my voice does not like breaking glass anymore." E During the session, he said, "It is good to be able to try several things. I'm so happy that my wife experienced a change on my voice tone."
5th–6th sessions	V During vocal improvisation, "It feels a little prickling, but I feel good since I could sing with higher pitch sounds." E He concentrated in the vocal improvisation changing pitch interval, and volume by himself. He said that "I could relieve stress and am delightful because I can sing the songs of love."
3. Patient C (M/74, PD duration for 10 years)	
He had a harsh voice, glottal fricative, soft voice and delayed speech, which made it a bit difficult to communicate with him. He felt depressed and cried often.	
1st–2nd sessions	V His shoulders and trunk moved more upward when inhaling. He vocalized on no pitch changing with quiet and harsh voice. E He was unwilling to participate in therapeutic vocalizations. Korean folk songs with drum beats made him excited so he sang more loudly.
3rd–4th sessions	V He tried to inhale with his nose. He hummed and further controlled his vocal dynamics as well as vocalizing on 'i-e' vowel by attacking vocal cords. E He improvised his voice with simple melodies more than 30 seconds and said "My concern fly away during this vocal improvisation. I feel very peaceful."
5th–6th sessions	V Although he twisted of his upper body and face frequently, he vocalized slow and softly without a harsh voice, and he was able to sing his favorite songs. E After singing his medley, he said "I feel good because I can look back on my happy childhood when I sing the songs from that time, despite the fact that I am getting older with incurable disease."
4. Patient D (F/61, PD duration for 3 years)	
She seemed to be a closed person and she had uncomfortable attitudes even though her GDS score showed pretty low. She did not tell her husband about her disease. There were no problems for voice but the movement of oral muscles became rigid.	
1st–2nd sessions	V She passively adjusted the vocal range and volume to the musical changes. E She seemed to be rather passive and nervous when choosing her favorite songs and the way to express the lyrics.
3rd–4th sessions	V To increase the movements of oral muscles, she actively participated by using specific vocalization of vowels. E During the session for song reminiscence in her youth, she expressed positive memories and current issues.
5th–6th sessions	V During the session of vocal improvement with humming and a touch bell, she tried to vocalize in diverse pitches. E She seemed to be comfortable and focused on her music with smiling during vocal improvisation.
5. Patient E (F/74, PD duration for 3 years)	
The delayed speech initiation and soft voice caused miscommunication in her daily lives.	
1st–2nd sessions	V She had short inhales and maintained just four seconds with steady volume so there are rather difficulties in following vocalizing patterns. E During the session of song reminiscence, she recalled the memories from childhood, the difficulties in supporting her family and the fear of the disease, which made her shed tears.
3rd–4th sessions	V She tried to expand the diaphragm capacity and to maintain diaphragm downward with singing that helped her to change the breath and the vocal volume. E After singing her favorite songs, she said that "It is very pleasant that there are no worries and bothering thoughts when singing together."
5th–6th sessions	V She maintained the patterns of inhale and exhale properly and expanded the vocal range and the dynamics. E She said "It is very helpful and joyful to have my own time and have the energy for my life."
6. Patient F (F/63, PD duration for 3 years)	
She worried how much rigidity her body became and lost control of her own body. She was not comfortable due to the hearing aids which she started using recently. She had a quiet voice and unclear pronunciation so she was frequently concerned about that she may sound tired all the time.	
1st–2nd sessions	V She said "It is not easy to sing along due to the amount of saliva produced." E She expressed negative perception regarding her voice and physical movements.
3rd–4th sessions	V She felt the differences in her voice after vocalizing which helped relaxation and reinforcement for the nerves and muscles of larynx. E She said "It is very joyful to sing along to my vocal range and tempo properly."
5th–6th sessions	V Humming enhanced her auditory feedback and vocalizing helped her better control saliva as well as the vocal volume. E She expressed pleasure from being able to adjust the voice and physical movements naturally during song-making activity.
7. Patient G (F/78, PD duration for 3 years)	
She was uncomfortable when the others could not hear her voice well.	
1st–2nd sessions	V She had short breath and passive participation in making vocal dynamics changes and singing various songs. E She showed lots of tears when singing and discussing the lyrics. She frequently appealed that "I miss my family who was left in North Korea due to Korean War."
3rd–6th sessions	V Dropped out due to an influenza infection. E Dropped out due to an influenza infection.
8. Patient H (M/59, PD duration for 2 years, taxi driver)	
He had delayed phonation, out of loudness control and masked face and had less anxiety of communication in work place. His voice was rather louder so he felt uncomfortable between conversations with taxi cab passengers.	
1st–2nd sessions	V When vocalizing, the first note of voice was delayed and it was hard to control his voice volume so he sang a song loudly. E Although various musical stimulation and songs were played, he passively showed the thoughts and expression with his masked face.
3rd–4th sessions	V He vocalized with self-controlled respiration patterns following different tempo and dynamics. E During the session of song reminiscence to recall the memories, he expressed the gratitude to his family and wife.
5th–6th sessions	V He adjusted the volume comfortably while singing and he felt clearer and more relaxed on his voice. E He seemed to be happy for his own lyrics when making his personal song for hands exercise in the taxi.
9. Patient I (F/67, PD duration for 9 years, home-based sessions)	
The sound of the breath was short and the voice had irregular tremor. Although her life was isolated due to severe Parkinson's symptoms, she had positive verbal expression due to her supportive family.	
1st–2nd sessions	V She sat on the bed and sang in a very sharp and trembling voice. E She liked to sing along in her room and recall her memories upon her favorite songs.
3rd–4th sessions	V She tried to adjust the position of her trunk with the regular patterns of exhale and inhale by changing the dynamics. E She said that "The positive feelings from singing positively affected my way of walking."
5th–6th sessions	V She liked to sing louder with her favorite songs which increased her maximum phonation time. E She showed a smile on her face and said that "I feel alive to play the instruments and sing with loud voice even though I cannot move independently."

PD: Parkinson's disease, V: vocal responses, E: emotional responses.