

Patient Perspectives and Satisfaction following a Short-term singing Intervention in Systemic Sclerosis Patients: A Cross-sectional Study

Pasinee Srinithiwat, MD¹, Chingching Foocharoen, MD¹, Ajanee Mahakkanukrauh, MD¹, Tippawan Onchan, MD¹, Patnarin Pongkulkiat, MD¹, Orathai Wantha, RN², Siraphop Suwannaroj, MD¹

¹ Department of Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

² Division of Nursing, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

Background: Singing may have the potential to enhance emotional and physical health and contribute to the growing field of non-pharmacological interventions in rheumatic diseases. However, data on the outcomes of music therapy in systemic sclerosis (SSc) are limited.

Objective: The present study aimed to evaluate the impact of singing interventions on patient perspectives and satisfaction among individuals with SSc.

Materials and Methods: A cross-sectional study was conducted among adult SSc patients followed-up at the Scleroderma Clinic, Khon Kaen University. Patients participated in a singing session between September 1, 2023, and December 31, 2023 and completed evaluation forms both before and after the singing were included.

Results: A total of 166 patients participated in the singing session, with a female-to-male ratio of 1.9:1. The mean age and mean disease duration were 60.3±10.3 years and 8.2±6.9 years, respectively. The majority of patients had the diffuse cutaneous SSc subset (69.9%). Eighty patients completed the evaluation form, reporting that singing reduced breathing difficulty (18.8%) and decreased concern about SSc (5%), while increasing stress relief (3.8%) and improving lung function (3.8%). Additionally, 12.5% of participants reported enjoying the singing session, and 16.3% expressed a desire to continue singing in the long term. None of the participants reported feeling exhausted from singing.

Conclusion: Singing may positively influence patient perspectives and satisfaction by providing stress relief, serving as a joyful activity, and acting as a breathing exercise for SSc patients. It represents a non-invasive, non-pharmacological approach to improving both physical and psychological outcomes in these patients.

Keywords: Systemic sclerosis; Scleroderma and related disorders; Breathing exercise; Patients perspective; Stress; Depression

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Systemic sclerosis (SSc) or scleroderma is an immune-mediated rheumatic disease that is characterized by fibrosis of the skin and internal organs and vasculopathy⁽¹⁾. Patients with SSc can broadly be segregated into two major subsets defined by the pattern of skin involvement and associated with characteristic clinical and serologic features and natural

history. Patients with diffuse cutaneous SSc subset (dcSSc) have extensive skin induration, starting in the fingers (sclerodactyly) and ascending from distal to proximal limb and the trunk. While patients with limited cutaneous SSc (lcSSc), Raynaud's phenomenon generally precedes sclerodactyly and skin involvement remains confined to finger, distal limbs and face, while trunk is spared.

SSc also affects the vocal folds, resulting in voice changes. Research indicates that approximately 9% of SSc patients experience intermittent dysphonia, often linked to laryngeal involvement and gastroesophageal reflux disease (GERD)⁽²⁾. The effect of fibrosis in SSc in respiratory tract often leading to interstitial lung disease (ILD), which significantly impacts morbidity and mortality. The prevalence of ILD in SSc patients ranges from 25% to 95%⁽³⁾.

SSc presented a range of clinical features that significantly impact patient quality of life (QoL)⁽⁴⁾. Common manifestations include skin thickening, Raynaud's

Correspondence to:

Suwannaroj S.

Department of Medicine, Khon Kaen University, Khon Kaen 40002, Thailand.

Phone: +66-43-363746

Email: siraphop@kku.ac.th

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phenomenon, and internal organ involvement, which collectively contribute to physical and psychological distress. Facial signs in SSc negatively impact self-esteem, correlating with low self-esteem levels in patients⁽⁵⁾. The disease is also associated with a high prevalence of depression with the prevalence of depressive symptoms of 36% to 65% in SSc patients, and the pooled prevalence by a systematic review of 41%⁽⁶⁾. Factors contributing to depression include physical limitations, pain, and disease severity, with study showing that nearly half of SSc patients had depressive symptoms⁽⁷⁾. Despite these findings, some patients managed to maintain lower levels of anxiety and depression even with severe symptoms, emphasizing a need for targeted psychological support and interventions⁽⁸⁾.

Music therapy is a therapeutic method used in various medical fields to treat mental health issues, reduce stress, and promote relaxation. It is cost-effective, widely available, and customized to suit individual preferences⁽⁹⁾. Music therapy has shown potential in addressing various symptoms associated with SSc, particularly in enhancing emotional well-being and physical functioning. It has been reported to improve emotional health in patients with chronic neurological conditions. It helped feelings of identity loss and emotional distress, which are common in chronic illnesses⁽¹⁰⁾. Singing for Lung Health (SLH) has been linked to improved lung function metrics, such as minute ventilation and inspiratory muscle strength, which are essential for ILD patients⁽¹¹⁾. While research on music therapy particularly singing activity in SSc remains limited, It shows promise in improving both emotional and physical health.

Objective

To evaluate the impact of singing interventions on patient perspectives and satisfaction among individuals with SSc, contributing to a growing field of non-pharmacological interventions in SSc.

Materials and Methods

A cross-sectional descriptive study was conducted among SSc patients over 18 years of age who were diagnosed according to 2013 ACR/EULAR classification criteria for SSc⁽¹²⁾, and were followed-up at the Scleroderma Clinic, Srinagarind Hospital, Khon Kaen University, Thailand, between 1 September 2023 and 31 December 2023. We included patients who participated in the singing sessions during the study period and completed evaluation forms both before and after the sessions. We excluded the patients with a) severe pulmonary arterial hypertension (PAH), b) advanced interstitial lung disease (ILD), c) cognitive impairments, d) severe mental health disorders, e) speech difficulties, f) hearing loss, g) unable or unwilling to

participate fully in the singing sessions, or h) the conditions that could lead to significant respiratory distress during singing.

The singing activity was around 15 to 20 minutes per session. The participants can stop singing anytime during the session. The song used in the present study is a pop song originally in English but later translated into Thai. This song was specifically chosen by the researcher for use in the present study. The participants were asked to complete the evaluation form anonymously before and after singing. The evaluation form is composed of questions about the perspective of singing the satisfaction during singing. The clinical data from the medical records on the day of participation in the singing session were reviewed. Clinical characteristics included demographic data, date at onset of SSc, SSc subsets, and clinical features of SSc.

Statistical analysis

Descriptive data were reported as proportions or percentages for categorical data and median with interquartile range (IQR) or mean with standard deviation (SD) for continuous data as appropriate. All statistical analyses were performed with STATA version 16.0. (StataCorp., College Station, TX, USA).

Results

A total of 166 patients were included in the study, of which 109 cases were female with the ratio of female to male of 1.9: 1. The mean age at disease onset was 52.4±11.9 years. The respective mean age on the date of participating singing session and mean disease duration was 60.3±10.3 years and 8.2±6.9 years. The majority were dcSSc subset (116 cases, 69.9%) with the overall median modified Rodnan skin score (mRSS) was 4 points (IQR 0 to 13). Half of cases were classified as World Health Organization functional class (WHO-FC) II and 50.6% had ILD. Patients' demographic data are presented in Table 1.

Of those who participated singing session, 80 anonymous cases (48.2%) responded the evaluation form of their perspectives and satisfaction before and after the short-term singing intervention. Most cases (62 cases, 77.5%) responded that they had breathing difficulty, and 49 cases (61.2%) were concerned about disease itself before singing. Before singing, the majority (74 cases, 92.5%) thought that singing can improve their lung function, and 68 cases (85.0%) reported that singing can help relief stress. After singing, almost cases (77 cases, 96.3%) reported that singing can improve lung function with the difference before and after singing of 3 cases (3.8%). There were increasing in the response that singing as stress relief and improvement of lung function as well as enjoyment of singing and the desire to continue singing in the long term. Perspectives

and satisfaction response before and after the short-term singing intervention are presented in Table 2.

Discussion

This cross-sectional study focuses on patients with SSc

and examines their perspectives and levels of satisfaction following a short-term singing intervention. Half of the patients in the present study had dyspnea on exertion (WHO-FC II), while a smaller proportion reported shortness of breath during ordinary physical activities (WHO-FC III). These levels of functional disability may associated with various systemic complications of SSc, including ILD, PAH, renal disease, extensive severe skin involvement, and muscle weakness^(13,14). Among the patients who participated in the singing sessions, 50% had ILD, 6% had PAH, and 1.9% had muscle weakness, while none had renal involvement. Despite signs of functional disability, the patients reported positive experiences after singing. This suggests that singing may not negatively impact functional ability, even when organ system involvement contributes to functional limitations in these patients.

A proportion of our patients had breathing-related issues with 50.6% having ILD and 36.8% reporting cough symptoms. Following the singing intervention, the percentage of patients experiencing fatigue and breathing difficulties decreased significantly, from 77.5% to 58.8%, representing an 18.8% reduction. Additionally, 3% of patients reported perceiving an improvement in lung function after the intervention. These findings suggest that singing engages the respiratory muscles, helping to alleviate symptoms of breathlessness. The previous studies reported that singing may lead to physical benefits such as improved inspiratory muscle strength and better heart rate response during physical activity⁽¹⁵⁻¹⁷⁾. Singing has also been shown to enhance health-related quality of life and positively influence breathing, highlighting its potential benefits for lung health with regular practice⁽¹⁸⁾. Due to the methodology of our study, we excluded patients with advanced ILD, so we cannot conclude whether singing has benefits for these patients or if it would positively impact their perspectives and/or satisfaction. Nevertheless, based on our initial findings, we recommend promoting singing interventions for SSc patients without advanced internal organ involvement, particularly ILD.

The lack of an increase in the number of patients

Table 1. Demographic data

Data	n=166
Female sex, n (%)	109 (65.7)
Age at onset (years), mean±SD	52.36±11.9
Age on the date of participation (years), mean±SD	60.31±10.3
Disease duration (years), mean±SD	8.22±6.9
Diffuse cutaneous systemic sclerosis, n (%)	116 (69.9)
SSc clinical features on the date of participation	
mRSS (points), median (IQR)	4 (0 to 13)
Functional class I, n (%)	62 (45.3)
II, n (%)	69 (50.4)
III, n (%)	6 (4.4)
Raynaud's phenomenon, n (%)	70 (42.2)
Digital ulcer, n (%)	26 (15.7)
Digital gangrene, n (%)	0 (0)
Telangiectasia, n (%)	59 (35.5)
Calcinosis cutis, n (%)	18 (10.9)
Salt and pepper skin, n (%)	68 (41.0)
Edematous skin, n (%)	24 (14.5)
Tendon friction rub, n (%)	22 (13.3)
Hand deformities, n (%)	66 (39.8)
Synovitis, n (%)	18 (10.9)
Muscle weakness, n (%)	3 (1.9)
Esophageal involvement, n (%)	78 (47)
Stomach involvement, n (%)	21 (12.7)
Intestinal involvement, n (%)	40 (24.1)
Cough, n (%)	61 (36.8)
Interested events	
Interstitial lung disease, n (%)	84 (50.6)
Renal crisis, n (%)	0
Pulmonary artery hypertension, n (%)	10 (6.0)

SD=standard deviation; mRSS=modified Rodnan skin score; IQR=interquartile range

Table 2. Perspective before and after singing a song

Data	Before singing, n=80	After singing, n=80	Difference
Concerning about scleroderma disease, n (%)	49 (61.2)	45 (56.3)	-4 (5.0)
Breathing difficulties, n (%)	62 (77.5)	47 (58.8)	-15 (18.8)
Perceived exhaustion from singing, n (%)	26 (32.5)	26 (32.5)	0
Singing as stress relief, n (%)	68 (85.0)	71 (88.8)	+3 (3.8)
Lung function improvement from singing, n (%)	74 (92.5)	77 (96.3)	+3 (3.8)
Enjoyment of singing, n (%)	55 (68.8)	65 (81.3)	+10 (12.5)
Desire to continue singing in the long term, n (%)	55 (68.8)	68 (85)	+13 (16.3)

reporting perceived exhaustion from singing after the intervention may be due to the self-paced nature of the activity, allowing participants to stop as needed. This autonomy likely enhanced their tolerance and overall experience. While singing might appear less strenuous than traditional forms of exercise, the study found that its metabolic demands were comparable to those of walking at a moderately brisk pace⁽¹⁹⁾. This suggests that singing is not merely a light activity but has the potential to serve as an effective form of exercise, particularly for patients with SSc. Furthermore, finding from previous study revealed that singing can positively impact the 6-Minute Walk Distance (6MWD), suggesting it may offer a viable and accessible alternative for patients who are unable or unwilling to engage in conventional exercise programs⁽²⁰⁾.

The proportion of patients reported stress and concern about SSc before the singing intervention, indicating that more than half of the patients experienced significant stress and concern related to their disease. This finding is consistent with previous studies that associate such stress with uncertainties about the future, fear of disease progression, potential physical disabilities, and a reduced life expectancy⁽²¹⁾. SSc patients may continue to experience stress and concern due to their awareness that the disease currently has no cure^(22,23). After the singing intervention, the proportion of patients reporting stress and concern decreased from 61.3% to 56.3%, reflecting a 5% reduction. Additionally, the perception of singing as a stress reliever increased slightly, from 85% before the intervention to 88.8% afterward, marking a 3.8% rise. These findings suggest that singing positively influences patients by reducing their stress and concerns while strengthening their perception in its value as an effective and motivational aid for stress relief, even if the effect is modest.

Based on our observations, the authors found that patients' enjoyment of singing increased by 12% after the session, rising from 68.8% before singing to 81.3% after singing. Additionally, the number of patients expressing a desire to sing increased from 68.8% to 85%, reflecting a 16.3% increase. This indicates that, although singing may not directly reduce stress, it enhances mood and happiness, particularly for those with higher baseline stress levels. The findings can be explained by previous study showing that singing is associated with notable reductions in negative affect and increases in positive affect⁽²⁴⁾. Gray et al. reported that music therapy, including singing, has been linked to improved emotional states, resulting in feelings of happiness and contentment, particularly in patients with chronic conditions⁽²⁵⁾. In addition, previous studies suggest that music enhances patients' enjoyment and desire to sing due to factors such as social engagement, emotional health⁽²⁶⁻²⁸⁾, assistance in pain management⁽²⁹⁾, physical

engagement^(11,15) and singing may help better manage life stressors by promoting a more positive emotional state^(30,31). The positive effects of music therapy, making it a valuable as an effective intervention for promoting emotional and physical health among SSc patients.

The authors' study has several limitations that should be acknowledged. First, the specific song used in the intervention may have influenced patients' perspectives and satisfaction. Since the song was unfamiliar to most participants and featured somewhat challenging lyrics, it might have caused stress during the singing process, potentially affecting the results. Second, the anonymity of patients in data collection prevented us from linking demographic information to their questionnaire responses. This limitation restricted our ability to perform statistical analyses to explore relationships between variables in this cross-sectional study. Third, the intervention was short-term, with data collected only before and immediately after a single singing session. This brief duration may not have been sufficient to fully assess the impact of the singing intervention. Finally, the present study relied on subjective questionnaires, which reflect patients' self-reported perspectives but may not accurately represent objective clinical outcomes. These limitations should be considered when interpreting the findings of the present study.

The strengths of our study are noteworthy. First, this is the first study to specifically focus on singing interventions in patients with SSc, marking a significant contribution to the field. Second, the intervention was designed in a way that allowed all patients to participate, demonstrating its feasibility in real-life clinical settings. Finally, the group singing component likely enhanced the overall experience, making the intervention more enjoyable and engaging for participants. This aspect highlights the potential for group singing interventions to be integrated into SSc clinics in the future. Such programs could not only serve as a therapeutic tool but also enhance stronger relationships among patients, promoting social and emotional well-being.

The future direction of this research includes several key improvements. First, future studies could use familiar songs and allow patients to choose their songs, providing a more personalized and enjoyable experience. Second, the further study should conduct subgroup analyses, such as comparing outcomes between patients with ILD and those without, focusing on respiratory function as a key outcome. These comparisons could provide a deeper understanding of how different patient characteristics influence the effectiveness of the singing intervention. Third, implementing a long-term intervention that integrates singing into patients' daily lives—such as singing at home, while showering, or cooking—over a period of months could provide more robust data. Outcomes could then be evaluated before and after the intervention

to assess sustained effects. Finally, future research should include objective outcomes to complement self-reported data. For example, anxiety and depression could be assessed using standardized tools such as PHQ-19 depression scale, Hospital Anxiety and Depression Scale (HADS), while lung function could be measured through pulmonary function tests, the 6-minute walk test, oxygen saturation levels, and dyspnea indices before and after the intervention. These directions aim to enhance the rigor and applicability of future studies, ultimately strengthening the evidence for singing interventions in SSc care.

Conclusion

Singing has the potential to improve patient perspectives and satisfaction by alleviating stress, providing an enjoyable activity, and functioning as a breathing exercise for SSc patients. Participants reported improvements in respiratory function, reduced fatigue, enhanced enjoyment, and a greater desire to sing, highlighting its positive impact on both physical and emotional well-being. Singing serves as a non-invasive, non-pharmacological strategy to promote physical and psychological health in this population. It should be considered an integral part of the treatment plan, offering a holistic and patient-centered approach to improving outcomes for patients with SSc.

What is already known on this topic?

Music therapy is a therapeutic method used in various medical fields to treat mental health issues, reduce stress, and promote relaxation. Singing has been linked to improved lung function and inspiratory muscle strength. While research on music therapy particularly singing activity in SSc remains limited.

What this study adds?

Singing may have a positive impact on patient perspectives and satisfaction by alleviating stress, diminishing concerns about SSc, promoting enjoyment during sessions, and encouraging a long-term desire to continue singing. It serves as a non-invasive, non-pharmacological strategy to enhance both physical and psychological well-being in this population.

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Ethics approval

The Human Research Ethics Committee of Khon Kaen University reviewed and approved the study as per the Helsinki Declaration and the Good Clinical Practice Guidelines (HE671700). The need for informed consent was waived by The Human Research Ethics Committee of Khon Kaen University.

Conflicts of interest

The authors declare no conflict of interest.

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