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Virtual Community Singing During the COVID-19 Pandemic



BR/Andreas Hussong

When the COVID-19 pandemic became a major public health concern in the spring of 2020, the pandemic threatened not just our physical well-being, but also our social connections and the most basic pleasures of life. Singers around the world were devastated to find that making music together suddenly meant risking lives. News reports identified choral gatherings in Germany, Amsterdam, and the U.S. state of Washington as superspreader events, suggesting that singing might be an especially effective means of proliferating the virus. This potential for spread was soon confirmed by a series of controlled studies.

As a result, either by participant consensus or government decree,

in-person singing came to nearly a complete halt around the globe. Singers, however, were unwilling to abandon their practices altogether and within weeks had discovered or devised a variety of means by which to carry on virtually. They were challenged by the fact that current technology does not facilitate simultaneous multidirectional communication, yet they persisted out of an overwhelming need to sustain their communities and harmonize their voices.

Although I did not belong to an active singing group at the onset of the pandemic, I soon found myself drawn into the world of virtual singing. Like many, I was eager to make connections with other people and find comfort in collective music-making. I found that

I enjoyed online singing enormously, and that it was surprisingly fulfilling and meaningful. What began as a pastime soon became a research interest. I wanted to learn what other singers' experiences were and to understand how virtual singing served to build and sustain communities during quarantine.

I had previously conducted historical research into sing-along films, radio programs, and television programs—all instances of what I now call *mediated community singing*. The types of virtual singing practiced during the pandemic were similarly mediated, although using up-to-date communications and broadcasting technology. To understand how they functioned, I employed ethnographic methods, engaging other singers in open-ended

QUICK TAKE

Because singing in a group has been notoriously risky during the COVID-19 pandemic, singers devised a variety of means by which to carry on making music virtually.

Audiovisual delays during video chats are uniquely problematic for musicians. Low-latency communications platforms for musicians exist, but few are broadly accessible.

Singers who wanted to make music together in real time found ways to approximate the experience on Zoom, Facebook Live, TikTok, and other audiovisual platforms.

To prevent spreading the coronavirus, singers figured out creative ways to use audiovisual communication technologies to make music together.

Esther M. Morgan-Ellis



During singing, the expulsion of droplets and aerosols (left) is high, broad, and concentrated enough that this activity became particularly associated with superspreader events early in the COVID-19 pandemic, bringing in-group singing nearly to a halt around the world. Singers who wanted to make music together in real time devised ways to use accessible communications platforms to approximate the experience virtually. In the above still from a YouTube video, four people, including the author on bottom left, sing Sacred Harp hymns together on Facebook Live via a process described on page 34, in recordings compiled later into the video.

Courtesy of Irene Gilb; <https://youtu.be/P7NewmiPkww>

conversations via Zoom and taking careful notes on my observations and experiences. In the course of my research, I learned about the varied approaches to online singing and gained insight into how virtual music-making helped singers to endure months of social isolation, anxiety, and loss. On a personal level, I became deeply involved with several singing communities and made many new friends.

How Singing Spreads Coronavirus

Although at first health experts were not certain how the SARS-CoV-2 coronavirus was passed from person to person, it soon became apparent that the virus was contained in airborne droplets and aerosols (minuscule droplets measuring about 0.5–10 micrometers in diameter) that are released into the air when we speak. (See the blog post online “Optimal Conditions for Viral Transmission,” April 3, 2020.) In an experiment described in *Clinical Infectious Diseases* in August 2020, Prateek Bahl of the University of New South Wales in

Australia and his colleagues measured the expulsion of droplets and aerosols during the acts of singing, speaking, and coughing. Using a light source and high-speed camera (see image above, on left), they found that singing expelled droplets at approximately the same speed as speaking, but spread those droplets across a wide field, meaning that singers could infect those seated next to them. The droplets also remained airborne for a long period and were likely to follow airflow patterns, which suggested the simultaneous concentrated production of aerosols. In the same month, a study published by Malin Alsved of Lund University in Sweden and her colleagues in *Aerosol Science and Technology* confirmed that singing produced both droplets and aerosols at a higher rate than talking, although elements such as volume, range, and diction all introduced significant variation. Singing groups almost always meet indoors, choosing enclosed spaces with favorable acoustics, and singers prefer to be in close

proximity so that they can hear one another. Taken together, these factors made group singing an exceptionally high-risk activity during the pandemic.

Bahl, Alsved, and other investigators made recommendations to improve the safety of in-person group singing. Wearing masks was demonstrated to greatly reduce the production of droplets and aerosols, but singing in a mask presents several problems. Singers often open their mouths widely, which risks displacing the mask, and masks reduce the resonance and carry of voices. Several manufacturers developed specialized masks in which an internal frame holds the material away from the singer’s face, and these were adopted by some (especially professionals who relied on in-person singing for their income). Distancing, high-airflow ventilation, sanitation of surfaces, reduction of the number of singers, shortened rehearsal times, and moving rehearsals outdoors were also suggested to reduce the risk of infection.

However, many singers—especially those at high risk for negative outcomes from infection—continued to feel unsafe participating in group activity. It therefore became necessary to find virtual alternatives to in-person group singing.

The Latency Problem

During the pandemic, almost everyone had to deal with latency issues during virtual meetings—and these audiovisual delays during video chats are particularly problematic for musicians. *Latency* refers to the time delay in the transfer of digital data, usually over a network. In sending audio data, latency is introduced as a result of the distance between the subject and the microphone, the process by which data are converted from analog to digital (or vice versa), and the geographical distance between sender and receiver. Audiovisual communications platforms, such as Zoom, usually introduce additional latency to maintain audio quality in case



Courtesy of Jeff Whiting

Wearing masks reduces the dispersal of aerosols and droplets while singing, but there are some drawbacks, such as reduced resonance and volume. Several manufacturers developed specialized masks with an internal frame that holds the material away from a person's face, and these were adopted by some singers, especially professional performers.

Video conferencing software also automatically filters out sound other than speech, which can include singing; on Zoom, the user must manually enable the “original sound” setting to prevent this filtering from happening. Finally, conferencing software will slow down and speed up audio when a connection is weak—catastrophic in the case

quality to ensure the fastest transmission speed. This optimization is done by means of adjusting the sound sampling rate, the sampling buffer, and the network buffer. By setting each of these as low as possible while maintaining acceptable sound quality, the user can greatly reduce latency.

Although platforms such as Soundjack, Jamulus, and JamKazam can facilitate near-synchronous online music-making, there are a number of barriers to access. Users need a computer with an extremely fast processor, a wired microphone and headphones, and a wired internet connection—Bluetooth and Wi-Fi add un-

acceptable latency. Most importantly, they need cable or fiber-optic internet service, and they also must be reasonably close (in geographic terms) to their collaborators. All these platforms require a fair amount of expertise from the user, as well as patience during the initial trial-and-error period. In addition, they are audio-only, at least in practice—video transmission simply requires too much bandwidth. Although Soundjack has a video feature, it only functions at low resolution and with an exceptionally fast connection. For all these reasons, most singers looked for other options during the pandemic.

The “Virtual Choir”

One option for solving the latency issue is to record all the individual voices that make up a choral performance separately and bring them together into a “virtual choir.” In the early weeks of the pandemic, social media was awash with inspiring virtual choir videos. For example, the London choir Camden Voices’ YouTube video of their Cyndi Lauper cover “True Colors,” posted on March 22, 2020, quickly amassed more than 2 million views. In the video, individual singers appear in Zoom-style boxes artfully arranged to highlight soloists and to give screen time to every participant. At first, there was frequent misunderstanding among the public, with many believing that videos such as this one captured synchronous online music-making. However, virtual choirs are the end result of a laborious process

Zoom singing was profoundly meaningful to a large number of singers, despite its shortcomings.

data packets are delayed. In the case of speech, this delay—usually about 150 milliseconds—does not present a problem. That small delay, which sometimes causes two people to speak at the same time, might be annoying, but it is tolerable; it doesn’t generally impede communication. However, synchronous music-making requires a latency of no more than 20 milliseconds, which is about equivalent to the latency experienced by musicians in a large and resonant performance space.

There are additional problems with using Zoom and other video conferencing services to sing together. Because the software is designed for speech, it attempts to identify the principal speaker and boosts their audio while suppressing other channels.

of rhythmic music. Even under the best of circumstances, therefore, any attempts at group singing over Zoom and other platforms are garbled and out of sync.

Low-latency communication platforms tailored to the needs of musicians have existed for about 15 years, but most singers knew nothing about them before the pandemic. Each takes a unique approach to solving the latency problem. Soundjack, for example, facilitates a direct connection between computers (peer-to-peer), which eliminates the delay that results from routing data through a server. It also grants the user total control over audio quality. While platforms such as Zoom maintain high quality at a latency cost, the Soundjack user can manually optimize

through which videos of individual singers are assembled into a synthetic “performance.”

The virtual choir idea was pioneered in 2009 by choral composer and conductor Eric Whitacre, who was inspired by a YouTube video of aspiring composer Britlin Losee singing the soprano part to his composition “Sleep.” In her 2012 master’s thesis at Tufts University, Melanie Armstrong describes how Whitacre was suddenly struck with the idea to compile hundreds of similar videos into a virtual performance. This idea soon blossomed into an annual tradition, with more singers participating in Whitacre’s virtual choir each year. His most recent project, a rendition of his composition “Sing Gently” published on YouTube in July 2020, featured 17,572 singers from 129 countries.

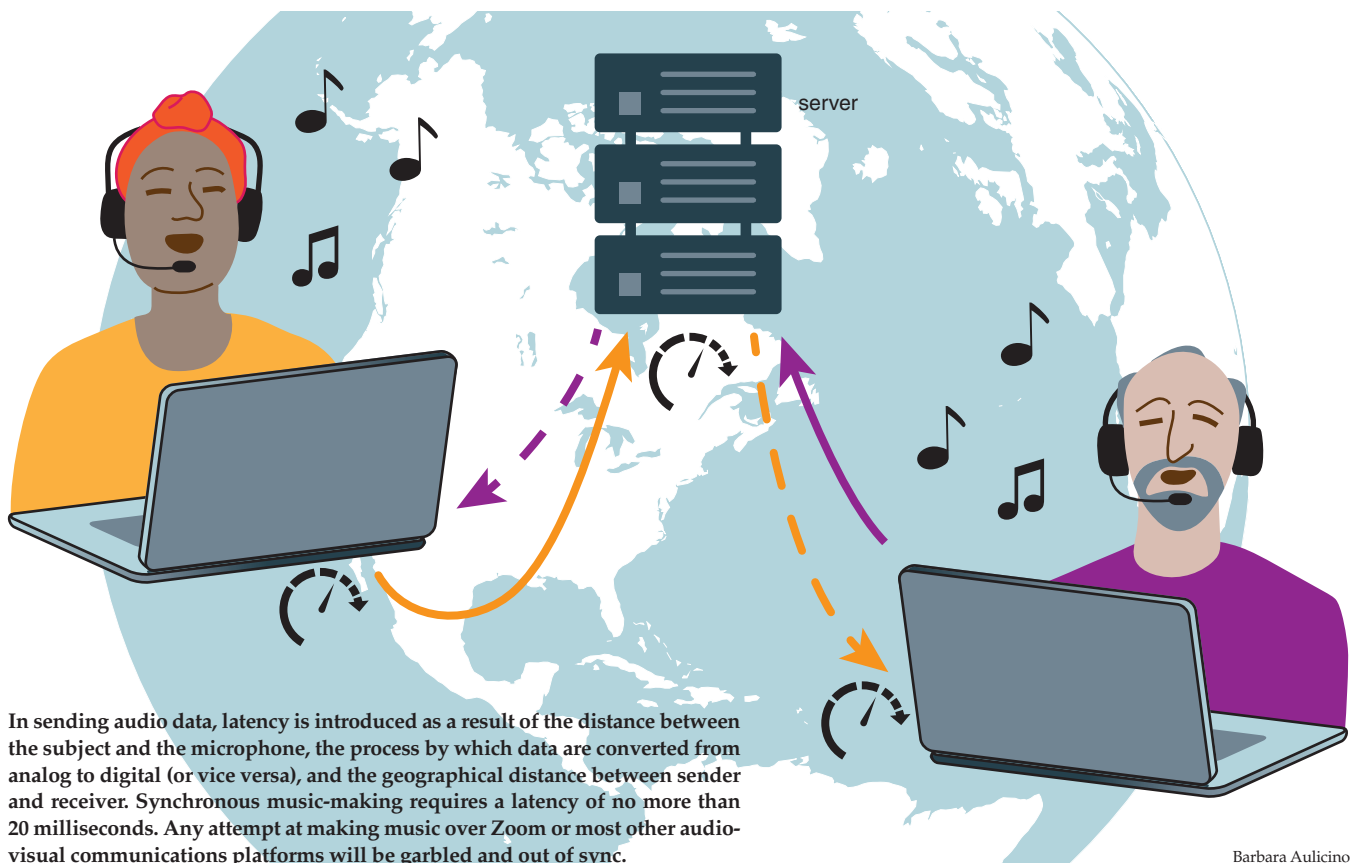
Although many others have put together virtual choir projects over the years, the onset of the pandemic brought a surge of attention to this modality of collective singing. Choirs forced to cancel their concerts instead presented their work in video form; friends who could not collaborate in person instead recorded contributions for assembly; and singers who had never met one another signed on to projects

meant to exhibit unity and resilience in the face of a global struggle. I myself contributed to two virtual choirs—one premiered a piece written in the early weeks of the pandemic by composer and conductor Colin Britt, and the other contributed hymns to a weekly church-service podcast assembled by organist and music theorist Chris White.

As was first documented by Armstrong and later confirmed by other researchers, most notably education researchers Lucila Carvalho of Massey University and Peter Goodyear of the University of Sydney in their 2014 book *The Architecture of Productive Learning Networks*, participating in a virtual choir can inspire a “sense of communion” and “profound feelings of connection” between singers. However, the act of singing in a virtual choir is performed in isolation, with each individual participant neither seeing nor hearing the others (contributors are usually provided with an accompaniment track to sing along with). Many singers—myself included—find the recording process to be somewhat stressful. Headphones make it difficult to hear oneself, yet are necessary to prevent the background sound from bleeding into the recording. The singer has to operate the recording equipment

and maintain awareness of the camera, all while feeling like a soloist instead of a chorister. This anxiety can be compounded in a shared living space, where others are always listening. And even after a singer manages to produce a good recording, the production of a virtual choir video is extremely time-intensive for those with the necessary software and expertise, and expensive for those without.

Recently, social media apps such as TikTok and Acapella have added a new dimension to the universe of online music-making. Although unique in form and function, these apps essentially facilitate the production of a virtual choir, the most significant difference being that users layer their voices one at a time instead of recording independently. TikTok’s potential as a platform for online community singing came to widespread public attention in early 2021, when a video posted by Scottish postal worker Nathan Evans sparked the #seashanty craze. Singers and instrumentalists around the world used the app’s “duet” function to add their own sounds to the video and publish the resulting collaborations. Apps can offer heightened possibilities for communal connection, because users can see the person(s) they are



In sending audio data, latency is introduced as a result of the distance between the subject and the microphone, the process by which data are converted from analog to digital (or vice versa), and the geographical distance between sender and receiver. Synchronous music-making requires a latency of no more than 20 milliseconds. Any attempt at making music over Zoom or most other audio-visual communications platforms will be garbled and out of sync.

Barbara Aulicino



On March 22, 2020, the London choir Camden Voices published a video of their cover of Cyndi Lauper's "True Colors," which amassed more than 2 million views. Such virtual choir videos, which edit together individual recordings to make a collective online performance, were especially popular during the pandemic.

Camden Voices; https://youtu.be/lqWQCWc_zCc

singing with, but they have their own limitations: TikTok videos cannot exceed three minutes in length, whereas Acapella is currently available only on iOS devices. Neither traditional virtual choirs nor social media-fueled collaborations can replace the group singing experience on their own.

Using Zoom to Sing Online

For those interested in community singing for the sake of the activity itself, and not for the production of a polished performance, virtual choirs fall short. The desire to see other singers and participate in music-making *in real time* drove many singing groups back to the ubiquitous platform Zoom, despite its many shortcomings. Although Zoom cannot facilitate synchronous multidirectional communication, and therefore cannot allow singers to join their voices together in harmony, users found a remarkable variety of ways to “hack” the platform for their own ends. My own research revealed that Zoom singing was profoundly meaningful for a large number of singers, allowing them to maintain community connection, revisit beloved repertoires, and keep up the weekly habit of dedicating time to song, even under adverse conditions.

My research during the COVID-19 pandemic addressed several participa-

tory singing groups, but focused on the activities of Sacred Harp singers. Over the course of several months, I interviewed 22 singers about their experiences and participated in hundreds of hours of online singing. Sacred Harp is a tradition with roots in the American South, although it now has thousands of adherents around the world. It takes its name from an 1844 collection of Christian songs titled *The Sacred Harp*, which has been in continuous use ever since its initial publication. The current version of *The Sacred Harp* contains hundreds of four-part songs—treble (soprano), alto, tenor, and bass—written in a distinctive style. Singers in this tradition are not necessarily Christian. Many are, but others love the songs for their musical qualities, find alternative spiritual value in the poetry, or simply enjoy the robust singing style. Sacred Harp singers attend weekly local singings and travel to annual all-day singings and conventions, where all take turns choosing and leading a favorite song. Although some Sacred Harp singers used Jamulus, TikTok, and the virtual choir model to keep singing together during the pandemic, I found that Zoom singing was by far the most popular modality, and I became a regular participant in the weekly Zoom singings hosted by groups in Salt Lake

City, Chicago, and Toronto. Despite the platform's limitations, singers found remarkably creative ways to adapt it to their needs.

In most Sacred Harp Zoom singings, a host would share a video or audio recording while participants sang along on mute. The singers could not hear one another, but they were able to join their voices with those on the recording and have an experience that was in many ways similar to that of singing in person. Using Zoom, they were also able to see one another and converse between songs. Hosts found different ways to facilitate interaction: They invited singers to explain their song choices, used breakout rooms for intermittent chatting, and programmed Q&A sessions with guest speakers. In the Sacred Harp community, recordings hold special significance. Conventions are regularly captured on film and the videos are posted to YouTube. Audio recordings are similarly archived and enjoyed by singers, for whom they evoke memories of past experiences. Hosts were often able to choose video or audio recordings that included singers present in the Zoom meeting, and these recordings in turn inspired reminiscences about mutual friends or shared memories. Although many singers regretted not being able to hear the voices of those “present,” I learned that

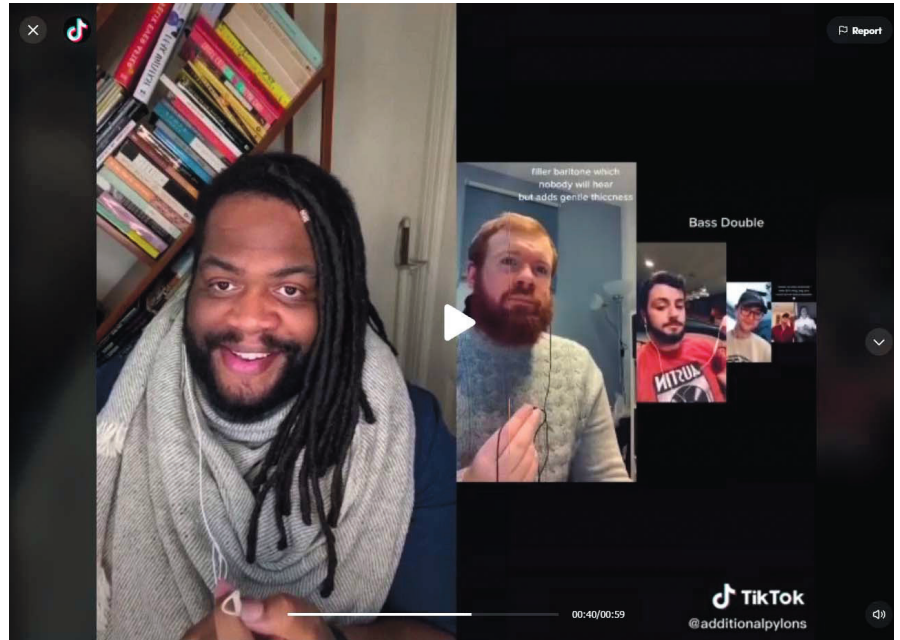
they found meaning in the ability to gather and sing in a virtual setting.

Some Sacred Harp singers used Zoom in another way, taking turns to unmute and sing one of the four parts for others to harmonize with. In this approach, the songs were almost always texturally incomplete; I only encountered one household containing enough singers to broadcast three or four parts. However, Sacred Harp singers know the songs well, and are usually able to “hear” the missing parts in their heads. They also appreciated getting to hear “live” voices and sing with another person in (near) real time. A drawback to this approach is that it places high demands on the musical ability of participants, who must be able to hold their own parts. When a singer leads a song, they essentially “perform” in total isolation and are responsible for maintaining pitch and rhythm. Likewise, if they want to harmonize with a leader, they can’t listen to other singers in their section to help them find the correct notes.

Many other musicians faced similar issues and can learn from what tightknit participation-oriented communities such as Sacred Harp singers figured out. Formal choirs also used Zoom to rehearse, and often employed the same techniques as Sacred Harp singers, either singing along with recordings or harmonizing with a solo leader. I also participated in Zoom choir rehearsals for which the director played parts on a piano while participants sang on mute. The purpose of such rehearsals was often to prepare singers to record solo videos, which were then assembled into a virtual choir. However, for presentational ensembles that seek to refine elements of intonation, blend, and phrasing, the fact that Zoom cannot facilitate simultaneous multidirectional communication is extremely limiting.

Singing on Facebook Live

People’s desire to sing together during the pandemic prompted some clever innovations to support quasi-synchronous group interactions. One of the most remarkable uses of technology for virtual community singing that I observed during my research was the way Sacred Harp singers figured out how to sing together through Facebook Live, which allows individual users to stream live video. To my knowledge, no other singing community used



<https://www.tiktok.com/@...swine/video/6915850231229713669>

TikTok user Machi (whose handle is @...swine) uses the platform’s “duet” feature to add a tenor harmony part to four other users’ harmonies to the sea shanty “Wellerman,” originally sung and recorded by Nathan Evans, whose small image is on the far right. The #seashanty craze of early 2021 demonstrated TikTok’s potential to facilitate online community singing. A drawback is that videos on TikTok cannot exceed three minutes in length.

Facebook Live in this way—and it’s no surprise, because it represents a creative and unlikely “misuse” of the platform (see figure on page 34).

Here’s how it works: A singer—a tenor, let’s say—broadcasts herself singing Sacred Harp songs. Somewhere else, a soprano watches that broadcast and streams herself singing along. This method requires two devices—one for playing the tenor’s stream and one for

is a delay in each of the broadcasts). Participants do not have to broadcast themselves; anyone who wants to sing along can join in with a Live video at any point in the chain, and singers are able to communicate with each other using the “comment” function.

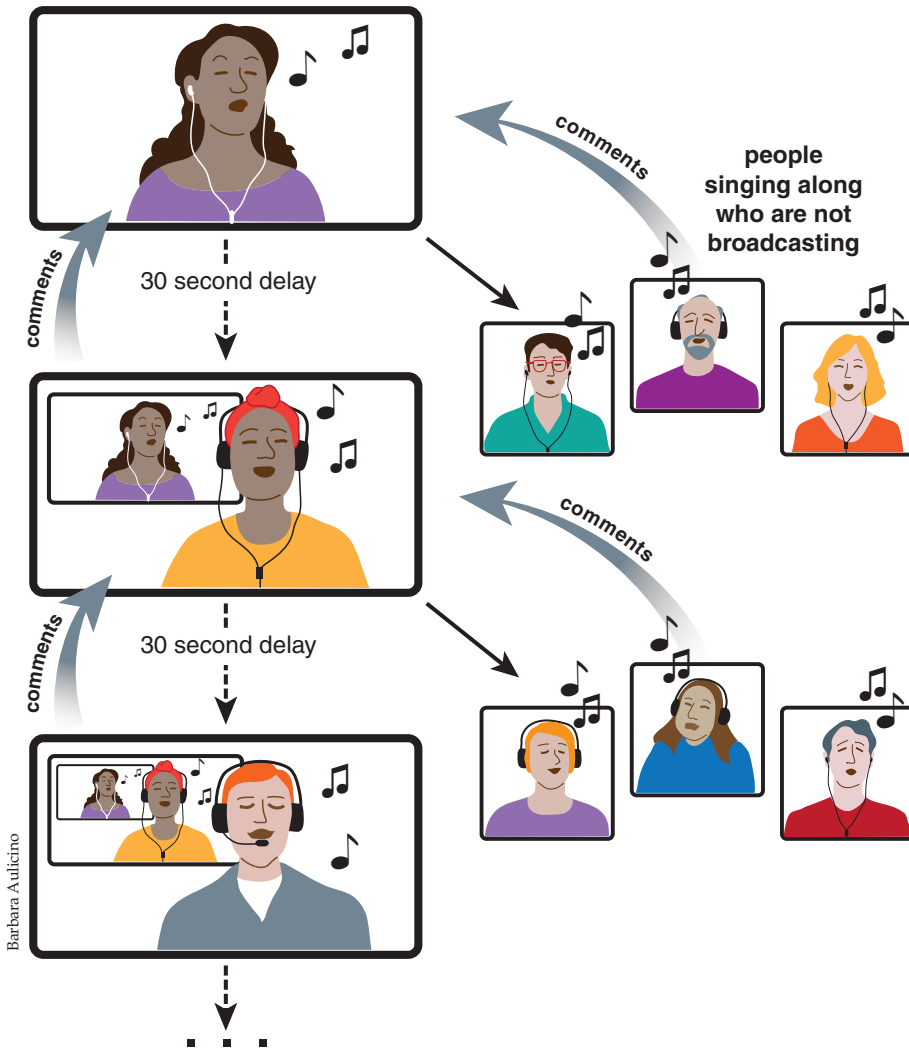
The Sacred Harp singers I interviewed in the course of my research enjoyed different virtual singing modalities. One told me that he preferred

Users found a remarkable variety of ways to “hack” different platforms for their own ends.

broadcasting her own stream—as well as a loudspeaker and a high-quality microphone. The result is that anyone who watches her broadcast will hear two parts, tenor and soprano. Somewhere else, a bass repeats this process to add his part, and yet elsewhere an alto completes the texture. Anyone watching the alto’s Facebook Live broadcast will only see the alto, but will hear all four parts, performed synchronously in near-real time (the voices sound in perfect synchrony even though there

Facebook Live in terms of the musical experience, but preferred Zoom when it came to the social angle. Another described the various modalities as being “like pieces in a puzzle.” No single option fulfilled all her needs, but taken together they constituted a fulfilling singing experience. The fact that Sacred Harp singers were convening in online spaces, including Zoom and Facebook, within two weeks of lockdown attests to the important role singing plays in their lives. Despite

Facebook Live singing



Barbara Aulicino

Singers in the Sacred Harp community, a music tradition with a unique harmony style that emphasizes participatory singing over performance, figured out how to sing together using Facebook Live, a platform for streaming live video. One singer (*top*) broadcasts herself singing one part. Somewhere else, another person can watch that broadcast while recording their live stream and singing along on a harmony part (*middle, on left*). Somewhere else, another person can watch that broadcast while recording himself singing along, so that all three parts are heard and broadcast together (*bottom, on left*). Anyone who wants to sing along to a broadcast can participate, commenting to one another and the broadcaster (*right*). This creative “misuse” of the platform allows quasi-synchronous group interactions.

the shortcomings of all virtual options, hundreds of singers participated faithfully until in-person singing became safer once again.

Diverse Virtual Singing Experiences

Simulating in-person experiences in a pandemic world has been challenging, and I interviewed participants to find out whether these virtual singings felt like “real” group singing. According to my research, that is strictly a matter of perspective. My interview subjects were all committed to online singing and found that it successfully simulated in-person singing to a greater or

lesser degree. In a later study, however, I recruited subjects who had tried online singing and did *not* enjoy it. They reported quite different experiences, including the sensation of singing to the computer itself. Arizona State University musicologist Kay Norton’s study of online singing during the pandemic, forthcoming in *The Oxford Handbook of Community Singing*, similarly identified a wide range of responses to virtual singing of all types.

Virtual reality scholars have been theorizing and testing such experiences since the 1960s, but the COVID-19 pandemic forced people into a huge,

real-world trial. The two principal means by which to measure the “realness” of virtual experiences were defined by virtual reality researchers Mel Slater of University College London and Sylvia Wilbur of the University of London in their 1997 article for *Presence*. The first, *immersion*, pertains to the qualities of the media itself. The second, *presence*, pertains to the user’s state of consciousness while engaging with the media. Significantly, these two variables operate independently; a high degree of immersion does not necessarily mean that users will experience a high degree of presence, especially if their ability to act is limited. Similarly, users can experience presence even when interacting with low-fidelity media. For example, conventional television is a low-immersion medium, insofar as it does not surround the user or offer a three-dimensional experience, but a viewer can still feel a high degree of presence, such as when they become emotionally involved in a gripping dramatic program. In a 2016 article for *Presence*, Stephen Gilbert of Iowa State University further suggested that the intentions and expectations of virtual reality users influence the level of presence they feel.

Online singing constitutes a low-fidelity virtual reality experience, one in which audio, video, and the user’s ability to act all fall short of the “real-world” ideal. However, a 2019 study that preceded the pandemic by University College London psychologists Daisy Fancourt and Andrew Steptoe, published in *Frontiers in Psychology*, found that virtual choir participants experience a greater degree of social presence than in-person singers. Further *Frontiers* publications—including 2021 studies by University of Queensland psychologists Grace Draper and Genevieve A. Dingle and by music technology researchers Helena Daffern and Kelly Balmer of the University of York, and Jude Brereton of In2Voice—have documented the many health and well-being benefits of virtual singing during the pandemic. An investigation into virtual concerts by psychologist and musician Dana Swarbrick of University of Oslo and her colleagues revealed that the unique circumstances of the pandemic heightened feelings of social connection and positive relational emotion. These recent studies all concluded that



Courtesy of Alexander Carôt

Jazz piano player Jamie Cullum performs for a live audience in London with musicians connected remotely in Birmingham and Bristol. This performance was possible through a sound engineering process that corrected for audiovisual latencies using Soundjack. With sufficient access to fast internet, as well as devices and platforms optimized for latencies, more people will eventually be able to participate in high-immersion virtual community singing. (From Carôt and Schuller, 2011.)

virtual singing has the power to sustain both singers and their communities in times of isolation, even when the available technology falls far short of our ideals.

Future Online Musical Connection

With time, latency problems will be solved and access to devices and sufficiently fast internet will expand. Whether in 5 years or 40, most people will eventually be able to participate in high-immersion virtual community singing, using technology that will facilitate real-time, multidirectional audiovisual communication. Great technological strides were made during the pandemic, with programmers working hard to improve the software that allowed people to commune in virtual spaces. At the same time, individuals acquired the skills and equipment necessary to sing online. Many of us developed new habits and joined or built dispersed communities. I, for one, do not plan to give up singing over Facebook with my new friends in California and New Mexico. Although Zoom singings will likely come to an end, many groups plan to begin streaming their in-person gatherings so that those far away can join in. The connections that isolated singers have established with one another during the pandemic will not easily be broken.

There is one obstacle that cannot be overcome through the development

of technology and infrastructure, and that is access to a private domestic space in which to sing. My research revealed that lack of privacy was the number one reason why singers did not participate in virtual singing. They were concerned about disturbing neighbors, embarrassed to be heard by roommates, or worried about waking sleeping children. There also continue to be remarkable inequalities in internet access based on geographic location. My own experience was mixed: As a middle-class homeowner I was able to secure a private singing space, but as a rural American without access to high-speed internet I was unable to use any of the available low-latency platforms or to broadcast high-quality video from my home. Better equipment alone, therefore, would not give me access to seamless virtual singing.

However, during the pandemic, I found that I did not need seamlessness. I needed to make genuine musical connections with other people—to feel like I belonged to a community of musicians. Most of the solutions described above, especially Facebook singing and Zoom singing, fulfilled my need 100 percent. I was able to fill my schedule with singing events, to “show up” and support fellow music-makers, and—most importantly—to sing, whether or not anyone could hear me. The singing might have been virtual, but the community was real.

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