Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

COVID-19: Impact on the Musician and Returning to Singing; A Literature Review

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Summary: Objective. The purpose of this study was to review current literature of the impact of COVID-19 on musicians and returning to singing.

Methods. A comprehensive search of peer-review articles was completed using PubMed, GoogleScholar, Scopus, and Web of Science. The search was completed using many key terms including voice, hoarseness, dysphonia, aphonia, cough, singers, and public speakers. The bibliography from each article found was searched to find additional articles. The search process revealed 56 peer-reviewed articles, 18 primary articles, ranging from the years 2019 to 2020.

Conclusion. COVID-19 has had a major impact on singers and other musicians worldwide. It can affect the voice and can lead to paresis/paralysis of laryngeal nerves to long-term changes in respiratory function. There is a risk from aerosolization/droplet formation transmission with singing, and with playing wind and brass instruments that can be mitigated by following COVID-19 guidelines. Ways to reduce possible transmission during singing and instrument play include virtual rehearsals or performances, mask-wearing, instrument covers, smaller choirs, performing outside, excellent ventilation being socially distanced, shorter rehearsals, regularly cleaning commonly touched surfaces and washing hands, avoiding contact with others, and temperature screening.

Key Words: COVID-19−Voice−Singers−Instruments−Masks−Music performance.

INTRODUCTION

COVID-19 symptoms include cough, dyspnea, fever, taste, and smell dysfunction. Its effects on the voice and its impact on musicians and other professional voice user can be profound. This review examines existing knowledge on COVID-19's impact on the instrumentalist and singer to help guide future priorities for research, therapies, and criteria for returning to professional voice use.

METHODS

A comprehensive search of peer-review articles was completed using PubMed, GoogleScholar, Scopus, and from Web of Science from the years 2019 to 2020. The search was completed using a many key terms including voice, hoarseness, dysphonia, aphonia, cough, singers, and public speakers. The bibliography from each article found was searched to find additional articles. The search process revealed 56 peer-reviewed articles, 18 primary articles, ranging from the years 2019 to 2020.

REVIEW

Impact on the voice

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which causes the disease COVID-19, can affect the voice. In a cohort of 702 American patients with mild-to-moderate symptoms from COVID-19, 26.8% experienced dysphonia.[1] This percentage is consistent with the 28.4% of patients with dysphonia in a cohort of 1420 European patients with mild-to-moderate symptoms.[2] The quality of the dysphonia varied. In a case series of 86 COVID-19 patients, 17.1% had very mild dysphonia, 2.9% had mild or slight dysphonia, 2.9% had moderate dysphonia, and 1.4% had severe dysphonia. The remaining patients did not report dysphonia.[3] Dysphonia can result for several reasons. It is a relatively common symptom of viral infections of the upper respiratory tract and can be the result inflammation of the vocal folds. More specifically to COVID-19, the vocal folds express a relatively high amount of ACE2 receptor, and infection by SARS-CoV-2 can lead to damaged vocal fold function. Because the ACE2 receptor also expressed in muscles of the chest, lungs, and abdomen, muscles used to phonate may weaken, leading to voice issues such as dysphonia.[1] Cough also is a common symptom and can cause vocal fold trauma, and even mucosal tears or vocal fold hemorrhage. Additionally, patients with severe COVID-19 infection may require intubation. Dysphonia and dysphagia after extubation are common.[4] In the cohort,[1] more females than males suffered from dysphonia, which could be due to sex-related differences in the inflammatory process although this is speculation, and further research is needed. There was a greater percentage of smokers among those with dysphonia compared to those without dysphonia. Additionally, those with dysphonia were more likely to have fatigue, chest pain, arthralgia, nausea, vomiting, diarrhea, cough, sputum that was sticky, and greater severity of dysphagia, nasal blockage, dyspnea, and ear, throat, and face pain.[1] It is likely that dysphonia is under-reported due to more serious symptoms such as cough, respiratory distress at the time of presentation. It is also possible that cough caused by COVID-19 can lead to dysphonia from laryngeal damage.

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Common otolaryngologic (ORL) symptoms across several cohorts included dysphonia, cough, sore throat, loss of smell, nasal blockage, rhinorrhea, and headache. In the cohort of 1420 European patients, 67.8% had nasal obstruction, and 60.1% had rhinorrhea while in another cohort of 1773 COVID-19 positive patients, only 4.1% had nasal congestion and 2.1% had rhinorrhea.[2,5] Less commonly, pharyngeal erythema, infection of the upper respiratory tract, and enlarged tonsils were present.[5] Similarly, in the cohort of European patients, 52.9% of patients presented with sore throat,[4] but in a cohort of 54 COVID-19 positive medical staff in Wuhan, China, only one person (1.9%) had a sore throat.[6] As ORL symptoms become more prevalent than they were prior to COVID-19, there have been more ORL-related Google searches. One study found that for ORL terms that were not medically technical, "Can't smell" saw the greatest increase in relative search volume, followed by "allergies," "voice pain," "ears ringing," and "ear pain."[7] Interestingly, the relative search volumes for "dysphagia," "dysphonia," and "thyroid nodule" all decreased. The study speculated that this could be because patients were not able to get their conditions evaluated by a physician, and that cancers possibly diagnosed less frequently as a result.

COVID-19 has potential long-term effects on singer and other professional voice users. COVID-19 can cause permanent lung damage. This lasting lung damage can cause mild-to-moderate reduction in pulmonary function (sometimes severe) that could be career-ending for professional voice users.[8–10] In a study of 150 patients who were followed up for 60 days after COVID-19, asthenia was reported in almost half of patients (74/150) at day 30 and 40% (52/130) at day 60. It was not determined whether dysphonia in each subject was due to neuropathy, vocal fold trauma from cough or intubation, malaise undermining vocal support, or some other cause.[11]

Aerosol and droplet transmission

The principal mode by which people are infected with SARS-CoV-2 is through exposure to respiratory aerosols or droplets carrying infectious virus. COVID-19 transmission can occur through contact transmission, droplet, or aerosol transmission. Droplet transmission consists of exposure to larger droplets when a person is close to an infected person and airborne transmission consists of exposure to smaller droplets and particles at greater distances. COVID-19 particles can also last in the air for hours and on surfaces for days.[12] An aerosol is less than 5 μm in size, and a droplet is greater than 5 μm.[13] Sneezing, coughing, and talking are well-known mechanisms for transmitting aerosols and droplets.[14-22] Duguid characterized respiratory droplets by size and duration for bacteria. Sneezing and coughing were more likely to contain pathogens compared to normal talking. The smaller the size the bacteria, the longer it survived on surfaces.[23] A 1997 study from Papineni and Rosenthal demonstrated the size distribution of exhaled droplets from human subjects from mouth breathing, nose breathing, coughing, and talking. They found that coughing produced the largest droplet concentrations, and nose breathing produced the smallest.[24] Booth et al detected airborne transmission from SARS 2005 in Toronto, Canada.[25] A study from Wei and Li in 2016 demonstrated that indoor transmission can occur with respiratory droplets and that the short-range airborne route may be important in close contact; and its control may be achieved by face masks for the source patients and use of personalized ventilation.[26] Aerosol transmission during voice use was characterized in Morawska et al in 2009, who indicated that vocalization emits up to an order of magnitude more aerosol particles than breathing, and recent work by Asadi et al (2019) established that the louder one speaks, the more aerosol particles are produced. These findings demonstrated an increased risk of spreading aerosols when singing and public (projected) speaking.[27,28]

Bahl et al used a respiratory droplet tracking apparatus to analyze whether certain syllables produced a greater aerosol/droplet velocity than others.[29] It found that respiratory droplets after "ti," "fa," and "do" were spoken had the same velocity (6 m/s) as respiratory droplets from usual speaking. Approximately 90% of droplets had a velocity of under 1 m/s and 75% had a velocity of under 0.5 m/s. Those that had a velocity greater than 1 m/s, tended to move between 120° and 240° from the mouth, while 75% of the droplets between 120° and 240° moved in all directions equally. Overall, the results found that greater amounts of aerosols were made during singing than repetitive speaking, and that the lower velocity droplets did not settle as quickly. In 2007, Yang et al characterized the size and concentration of respiratory droplets generated by a human cough. They found that the total average size distribution of the droplet nuclei was 0.58-5.42 micron, and 82% of droplet nuclei were in 0.74-2.12 micron range.[30] Lindsley et al characterized the quantity and size distribution of cough-generated aerosol particles in patients during and after influenza. They found that the number of particles produced per cough was higher in subjects who had influenza (average 75,400 particles/-cough, SD 97,300) compared with after the influenza had resolved (average 52,200, SD 98,600), although the difference was not statistically significant.[31]

The aerosols of SARS-CoV-2 can stay in the air for hours and stay on surfaces for days. A study from van Doremalen et al found that the stability of SARS-CoV-2 was similar to that of SARS-CoV-1 under the experimental circumstances tested. Their results indicated that aerosol and fomite transmission of SARS-CoV-2 is plausible.[32] Simonds et al evaluated the droplet dispersion from noninvasive ventilation, oxygen therapy, nebulizer treatment, and chest physiotherapy. They found that noninvasive ventilation and chest physiotherapy are droplet (not aerosol)-generating procedures, producing droplets of >10 μm in size. They suggested that healthcare workers working within 1 m of an infected patient should use a high level of respiratory protection. Nebulizers were found to produce small to medium size aerosols.[33] Asymptomatic spread through aerosols has been

documented.[34] A study from Hu et al demonstrated one of the first cases of asymptomatic spread in Germany.[35] Asymptomatic spread is a challenge for public health and has facilitated COVID-19 spread throughout the population.[36] This could increase risk for and from professional voice users.

Singing and musical instruments and the spread of COVID-19

Singing generates aerosols and droplets. In a 1968 study from Loudon and Roberts, singing increased the dissemination of tuberculosis compared to talking.[37] On April 29th, 2020, Germany set out rules for religious services including a ban on singing.[38] A study from Mürbe et al demonstrated increase in particle emission during singing and emphasized the importance of risk management for singing.[39] A study by Reid looked at aerosol concentrations produced by speaking, singing, and breathing. He found that speaking and singing showed steep increases in mass concentration with increase in volume (spanning a factor of 20-30 across the dynamic range measured, $P < 1 \times 10^{-5}$). He found that at the quietest volume (50-60 dB), neither singing ($P = 0.19$) or speaking ($P = 0.20$) was significantly different from breathing; however, at the loudest volume (90-100 dB), a statistically significant difference ($P < 1 \times 10^{-5}$) was observed between singing and speaking, with singing generating a factor of between 1.5 and 3.4 more aerosol mass, further distinguishing the capability for aerosol production during singing.[40] There have been multiple choir events of also cited with COVID-19 outbreaks. On March 29, 2020, the LA Times reported on a choir that decided to hold practice during the beginning of the COVID-19 pandemic that led to the death of two members in Mount Vernon, Skagit County, Washington.[41] Following a 2.5-hour choir practice attended by 61 persons, including a symptomatic index patient, 32 confirmed and 20 probable secondary COVID-19 cases occurred (attack rate = 53.3%-86.7%); three patients were hospitalized, and two died. They found that transmission was likely facilitated by close proximity (within 6 ft) during practice and augmented by the act of singing.[42] The COVID-19 pandemic might affect how large groups gather at events in the future, possibly long term. This poses several problems, including how groups will sing together.

On May 18, 2020, the Philadelphia Inquirer released an article suggesting that choir singing would not be safe until the pandemic was under control,[43] but that comment was based on opinion, not evidence. In an NPR discussion, Is Singing Together Safe In The Era Of Coronavirus? Not Really, experts lay out the dangers of singing in a confined area, citing the dangers of aerosolization for both singers and wind instrumentalists.[44] Another article in the New York Times also cited the dangers of aerosolization for choirs also citing, the Performing Arts Aerosol study.[45] The Performing Arts Aerosol study, a study by scientists from the University of Colorado, Boulder and the University of Maryland, commissioned by a group of over 120 performing arts groups, looked at a clarinet, flute, horn, soprano singers, and trumpet aerosolization.[46] In their preliminary investigations, they found that concentrations were relatively higher for instruments that had straight shapes from mouthpiece to bell (trumpet, clarinet), and that masks and nylon bell coverings reduced particle concentrations. Based on their initial simulation they confirmed the effectiveness of social distancing directives to keep 6 ft apart, as that is the boundary of the region around an infected person in which the risk of infection is high, especially with an exposure duration greater than 30 minutes.[43] They recommended that masks should be worn by all students and staff prior to entering a performing arts room. Masks should continue to be worn until all students are seated and ready for instruction and while talking. For instrument players, a small slit in the mask for the mouthpiece should be used while playing. In instrument groups where a mask physically be worn, the mask should be worn over the chin and replaced during periods during which the student is not playing. Each instrument player should have a 6 ft by 6 ft social distancing space; and straight lines should be used, as curved rehearsal positioning which is used routinely can affect the aerosol movement in a room. Students should all face the same direction, back to front, to minimize possible exposure. Spit pads or something similar should be used to catch discards from the spit valve to be properly discarded.[46] The bell covers tested in this study were made from pantyhose made of 80 deniers in two layers. It was also recommended that flute players can put the head joint between their mouth and mask and use a "flute sock" attached to the foot. It was further recommended that singers should wear surgical masks to reduce aerosol exposure. It was recommended that face shields are only effective at close range to stop large droplets and should have a surgical mask worn with the shield. Plexiglass partitions or barriers between musicians are not recommended based on the room's HVAC (Heating, Ventilation, Air Conditioning) system being unable to properly change the air as designed, creating "dead zones," or areas where aerosol can build-up. They recommended rehearsal space in order of preference as: outdoor rehearsals, using individual mitigation techniques described above, and outdoor gazebo style tents with open sides and high-pitched ceilings with mitigations. When indoors they recommended elevated outdoor air exchange rate from HVAC, typical outdoor air exchange rate from HVAC plus recirculation air through MERV 13 filters or addition of appropriately sized HEPA air purifiers, or with outdoor air exchange rate from open windows supplemented with appropriately sized HEPA air purifiers when airflow is reduced under certain outdoor wind conditions.[46] Ways to reduce possible transmission via singing include virtual rehearsals or performances, mask-wearing, smaller choirs, outside rehearsal and performance, socially distancing, shorter rehearsals, regularly cleaning commonly touched surfaces and washing hands, avoiding contact with others, and temperature screening. More research needs to

be conducted, especially as theaters, places of worship, and other venues make reopening plans and policies.[42]

Psychosocial impact

Another harmful effect of the COVID-19 pandemic is psychological stress, which can affect the voice negatively.[47,48] It is important to recognize the impact on the psychosocial stress of COVID-19[49,50] and it is imperative that people engage in activities that are safe and stress relievers. The World Health Organization released a document that addressed mental health and psychosocial considerations during the COVID-19 outbreak that encouraged regular routines and new routines that involved singing in one's own home.[51] Singing has the capability of bringing human beings closer together. In the initial outbreak in Italy on March 15, 2020, people quarantined in Italy joined in song and sang from their balconies to support first line workers.[52] One study examined how stress levels were associated with voice changes in a group of 313 Israeli professors as they switched to online teaching. The questionnaire allowed them to rate the severity of the following voice symptoms: fatigue, effort, weakening, throat soreness or pain, hoarseness, larynx dryness/irritation, the need to drink water often, and persistent throat clearing/coughing. Interestingly, those who had lower psychological stress before COVID-19 had a positive association between psychological stress and voice symptoms during the transition, and those who had higher psychological stress before COVID-19 had an even higher association.[53] Another study developed a VC-19 (*Voice COVID-19*) questionnaire and used it along with the *Singing Voice Handicap Index 10* and *Generalized Anxiety Disorder 7* questionnaires to examine the unique effect of COVID-19 on artistic voice users and actors. Artistic voice users had significantly greater *Generalized Anxiety Disorder 7* scores and greater "current stress" when compared to controls. Singers also had significantly higher *Singing Voice Handicap Index 10* scores compared to nonprofessional voice users. These results are believed to show that restrictions on voice use have affected the lives of professional voice use in multiple ways.[54]

Impact on patients with vocal prosthesis

Another voice complication from COVID-19 occurs in patients who have tracheoesophageal voice prostheses. Over time, these devices may lead to complications such as aspiration, which necessitate device replacement. Depending on circumstances, such as how severe the complication is and how far the patient is from an appropriate care facility, telemedicine may be used as a first approach due to the suspected high risk of treating/replacing these devices. If the patient must come to the office, proper precautions must be taken and may include having the patient tested for COVID-19. If a patient is positive for COVID-19 but has a life-threatening complication from a tracheoesophageal prosthetic device, full precautions must be followed, including having the head and neck surgeon do both the medical assessment and the procedure in order to reduce the number of people who come in contact with the patient.[55] Another study examined similar protocols in patients with voice prosthesis. Thirty-seven of 73 patients could be contacted via telemedicine (50.68%). The problem could be resolved via telemedicine for 23 of the 37 patients (62.16%), whereas the 14 others had to visit the office. Patients who participated in telemedicine had significantly lower levels of depression and anxiety comparing before and after the telemedicine appointment. These patients also were satisfied overall with their telemedicine visits. It was concluded that for many patients, telemedicine can resolve issues and should be considered a viable option in the time of COVID-19.[56]

Changes in the ORL office

Because of the COVID-19 pandemic, ORL office practices have had to make substantial changes. All healthcare workers have been at risk of contracting COVID-19, but healthcare workers in ORL are at a higher risk of coming in contact with a patient's respiratory droplets or aerosols via cough, sputum, and a tracheotomy, for example, due to the nature of the body region. High-risk procedures include video fluoroscopic swallowing exams and pharyngolaryngological endoscopy.[57] One perspective suggested primarily assessing the voice through clinical signs and reserving endoscopy for necessary instances.[58] Another suggested performing a transcutaneous laryngeal ultrasound instead of a flexible fiberoptic laryngoscopy, if possible.[59] Of course, ORL healthcare workers are advised to always wear proper personal protective equipment always, even if the patient does not need a high-risk procedure. This includes an FFP2 mask, eye and potentially face protection, head cap, a gown, and gloves. Patients who present to the ORL office with dysphonia all pose a risk, as it is not known whether the dysphonia is of COVID-19 or other etiology. Recent dysphonia in a patient certainly raises suspicion of COVID-19 etiology,[57] and all patients should be examined using precautions that would be followed if a patient had known, active COVID-19. Telemedicine is an option for some ORL patients. One study of 125 patients found that there was an 87% satisfaction rate with the telemedicine appointments. Whether a patient was satisfied or not was found to not be based on their clinical conditions.[60] However, the senior author (RTS) has found telemedicine to be of limited value for the many dysphonia patients who require laryngeal examination by strobovideolaryngoscopy to establish an accurate diagnosis and safe voice use recommendations.

There has been focused effort on researching ways to diagnose COVID-19 more effectively. One research group has been creating a database, named Coswara, that collects sound data on both COVID-19 and healthy individuals. The four main categories of data collection were cough type, rate at which numbers 1-20 could be counted, breathing type, and how a constant vowel was phonated. Sound databases have been successful for other respiratory

disorders such as tuberculosis, pneumonia, asthma, and pertussis; so, hopefully this approach will be successful for COVID-19, too.[61]

Voice and speech therapy

COVID-19 has had an impact on voice and speech therapy. Sund et al studied a single subject and found that in voice production during voice assessment and therapy, there was an increase in respiratory particles compared to normal speech and baseline. Respiratory particle counts were higher at 15 cm compared to 1 m from the particle sizer, suggesting that physical distance may reduce clinician exposure. In their study, the particles did not accumulate overtime.[62] Many voice therapy patients can have telemedicine sessions as can patients working with singing or acting voice specialists or teachers. This is a valuable modality, as it is estimated that 30% of people have a voice disorder, and this number is greater among professional voice users.[63] Statistically, some of these patients will be infected, perhaps without symptoms; and telemedicine will allow voice therapy and training to proceed safely for patients and providers. At this time, the patient should only have in-person sessions if necessary, with the understanding that there is a risk of spreading COVID-19. Semioccluded voice therapy exercises, such as speaking into a straw or tongue and lip trills, are popular voice exercises that cause the vocal tract to narrow, which can create turbulent and fast airflow and spread respiratory droplets easily.[63,64] A protective measure is for the therapist and patient to both wearing masks. However, in this case, voice therapy sessions may be harder to conduct because the therapist may have difficulty demonstrating the exercises and the patient may have difficulty repeating them. Mask protection is also compromised when using a show. Voices may also be more difficult to hear on both sides, so the therapist may have difficulty concluding whether the patient performed the exercise correctly. However, if the patient and voice therapist decide to conduct an in-person session, precautions reduce the risks of spreading COVID-19 can be followed without substantially compromising the quality of the session.[63]

One study showed that there was greater airflow velocity in loud and whispered voices than in normal-volume voices use, consonants had greater airflow velocity than vowels, voice therapy exercises created lower airflow velocity than deep exhalation, and deep exhalation or constant vowel sound had a very high airflow velocity initially that decreased quickly. If these and other factors are understood and appropriate precautions are used, the risk of spreading COVID-19 can be minimized.[64] Another consideration is barriers to telemedicine voice therapy sessions. A study of Italian and French patients found that the four difficulties of telemedicine voice therapy were the lack of proper devices, such as cameras or software, not all voice therapists being confident in how to use technological devices the fact that elderly and poor patients may not have access to the required technology, and that the healthcare system and certain insurance companies do not pay for virtual voice therapy.[63] However, many studies have shown that telemedicine voice therapy is a viable alternative in a situation such as COVID-19. Many studies suggest that clinical outcomes from voice therapy via telemedicine are often not significantly different from those achieved when sessions were conducted in-person.[65] One study of telemedicine voice therapy for vocal fold nodule patients found that the patients had significantly improved clinical outcomes.[66] A similar conclusion was reached in a study with a cohort of muscle tension dysphonia patients.[67] Telemedicine voice therapy can be synchronous, in which the sessions can be performed in real-time, asynchronous, in which both the clinician and patient can upload/view materials at their own time such as videos or audio, and hybrid, which encompasses both synchronous and synchronous methods.[68] Voice therapy sessions should be provided in safe and practical ways for patients, whether the session is virtual or in-person; and patient therapy need not be interrupted because of the COVID-19 pandemic.

Treatments

One interesting COVID-19 treatment option that has been proposed is hypertonic saline nasal irrigation and gargling. This was shown to decrease the time course of the COVID-19 upper respiratory tract infection by 1.9 days, transmission between people of the same household by 35%, usage of over-the-counter medication by 36%, and viral shedding.[67] A biochemical explanation for these results is that enveloped and nonenveloped RNA and DNA viruses were shown to be unable to proliferate in the presence of chloride ions. The viruses that were tested were coxsackievirus B3, influenza A virus, respiratory syncytial virus, human coronavirus 229E, and herpes simplex virus.[69] Proton pump inhibitors (PPIs) are used commonly in voice patients and have been tied to increase risk of COVID-19.[66] In their study of 53,130 participants with 6.4% having reported a positive COVID-19 test, those using PPIs once daily had an adjusted odds ratio of risk of COVID-19 of 2.15 (95% confidence interval 1.90, 2.44) or twice-daily PPI treatment an adjusted odds ratio of 3.67 (95% confidence interval 2.93, 4.60), compared with patients receiving no PPI therapy. They also found that patients taking Histamine H2 blockers were not at an increased risk.[70] PPIs are used in gastrointestinal hemorrhage and several studies have demonstrated an overall benefit with the use of prophylactic PPI, particularly in patients taking dual antiplatelet therapy and/or concomitant anticoagulation. However, with the possibility of risk of COVID-19 PPIs need to be used carefully.[71] Nevertheless, these data need to be interpreted cautiously before making any conclusions about causation which might be either PPI use or reflux. Patients receiving only H-2 blockers may have milder reflux than those requiring a PPI; and those requiring PPI twice daily almost always have worse reflux problems than those controlled with one PPI. Reflux commonly affects the respiratory tract. So, the implications

of these findings remain unknown. Typically, corticosteroids are used in patients with severe COVID-19. Systemic (as opposed to topical) steroids usually do not have adverse, long-term effects on the voice unless they are used for prolonged periods of time. There is no evidence of a causal association between COVID-19 steroid treatment and dysphonia. The use of antibiotics during treatment for COVID-19 is not routine and should not affect their voice, and anticoagulant therapy is relevant only if it results in vocal fold hemorrhage.

Returning to singing and instrument playing

The Wisconsin Council of Churches released a guideline on church music in the time of COVID-19. This council recommended using recorded music rather than live music; using piano, electronic keyboard, organ, stringed, or percussion instruments rather than wind and brass instruments; having outdoor worship to allow for greater space for social distancing, improved ventilation and encouraging singing sacred music at home.[72] The American Choral Directors Association released a COVID-19 response committee report on June 15, 2020. The report was broken down into different age groups (middle school/junior high, senior high school, collegiate, community: youth and adult, and music in worship) and the teaching style (face-to-face, hybrid and full remote). In general, they recommended reorganization into smaller groups to meet social distancing guidelines, wearing masks, having remote access for students with access to the internet, and using outdoor spaces when feasible. It is important to continue to make the social connections that are so significant in this age group.[73] The American Choral Directors Association chose to prepare this document without medical or scientific input. Singing is possible with a mask but may cause breathing challenges for some, and this may affect especially singers with underlying pulmonary dysfunction. Voice fatigue is common but can be mitigated through voice therapy and/or training, finding a properly fit mask that allows for free movement of the jaw, and by taking voice breaks to rest and hydrate.[74]

The American Federation of Musicians (AFM) released a guideline for returning to work safety. As with previously mentioned guidelines, the AFM reinforced the importance of the need for safety practices. For small-and-medium sized live venues, the AFM recommended keeping social distancing both onstage, and in the audience, no dancing, but use of the dance floor as a way to social distance from the audience, making sure one act leaves the stage completely before the next comes on, using virtual tip jars, and using drum shield-style Plexiglas in front of stage (singers) and between and/or in front of winds and brass. In the recording studio, it was recommended that winds and brass instrumentalists be separated when possible, congregation in the studio be avoided, musicians bring their own microphone and headphones, and that sanitization of equipment and surfaces be assured.[75] To return safely to the theatre, similar guidelines will apply including social distancing, mask-wearing, health screenings, and avoiding shared equipment.[76] The National Association of Teachers of Singing put together a list of risk assessment tools that can be used to stratify the risk of COVID-19, transmission as well as guidelines like those previously mentioned.[77] The New York Times article, When Will it be Safe to Sing Together Again, pushed forth the pivotal question of when will be the right time? The article mentions that in Norway, up to 50 people can sing together as long as everyone keeps 3 ft apart, while in Germany, the rules for group singing vary by region, with some regions spacing singers 10 ft apart and other regions banning group singing. In the Netherlands, after more than 100 choristers became ill after a single concert in Amsterdam, group singing activities were strongly discouraged.[78] In order to return to music and theatre safely, it is important for musicians and professional voice users to follow social distancing, wear masks and follow COVID-19 guidelines.

CONCLUSION

COVID-19 has had a major impact on singers and other musicians worldwide. It can affect the voice and can lead to paresis/paralysis of laryngeal nerves to long-term changes in respiratory function. There is a risk from aerosolization/droplet formation transmission with singing, and with playing wind and brass instruments that can be mitigated by following COVID-19 guidelines. Ways to reduce possible transmission during singing and instrument play include virtual rehearsals or performances, mask-wearing, instrument covers, smaller choirs, performing outside, excellent ventilation being socially distanced, shorter rehearsals, regularly cleaning commonly touched surfaces and washing hands, avoiding contact with others, and temperature screening.

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