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Reentry Following COVID-19: Concerns for Singers

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INTRODUCTION

The target of this paper is captured in its subtitle: "Concerns for Singers." While the COVID-19 pandemic has wreaked devastation upon disparate types of people around the world, singers, and those who teach and collaborate with them, are a vulnerable cohort within this larger global health crisis. This vulnerability is due to a number of facts about the SARS-CoV-2 virus, beginning with its three main routes of transmission as outlined by the U.S. Centers for Disease Control and Prevention (CDC): (1) inhalation of very fine respiratory droplets and aerosol particles; (2) the deposition of virus-containing droplets and particles on exposed mucous membranes in the mouth, nose, or eye by direct splashes and sprays; and (3) touching mucous membranes with hands that have been soiled either directly by virus-containing respiratory fluids or indirectly by touching surfaces with virus on them.[1]

The CDC has further explained that "the risk of SARS-CoV-2 infection varies according to the amount of virus to which a person is exposed" and notes that the two main variables concerning this amount are *distance* and *time*.[2] Regarding the former, how far away an individual is from the respiratory droplets of an infected person, combined with the observation that the concentration of the virus is diluted by both gravity (heavier drops fall) and mixture with air, illustrates why the CDC states that "the available evidence continues to demonstrate that existing recommendations to prevent SARS-CoV-2 transmission remain effective. These include physical distancing."[3] The parameter of time exerts a similar dilution of viral viability and potency.

Yet using those same parameters of distance and time, the CDC also notes that "transmission of SARS-CoV-2 from inhalation of virus in the air farther than six feet from an infectious source *can* occur [emphasis added] under certain preventable circumstances," one of which is "Prolonged exposure to these conditions, typically more than 15 minutes."[4] The CDC report goes on to note two other factors that increase the risk of SARS-CoV-2 infection.

- Enclosed spaces with inadequate ventilation or air handling within which the concentration of exhaled respiratory fluids, especially very fine droplets and aerosol particles, can build-up in the air space.

- Increased exhalation of respiratory fluids if the infectious person is engaged in physical exertion or increases the intensity of their voice (e.g., exercising, shouting, singing).[5]

It has been shown that there are significantly higher emission rates for singing compared to mouth breathing and speaking.[6] This finding plus the CDC report indicates that the typical voice teacher who instructs singers on a back to back hourly schedule in a one on one setting, often in a small room with poor ventilation, may be especially vulnerable to COVID infection, particularly from unvaccinated students and collaborators (e.g., pianists). Indeed, voice teachers in these situations could be considered "sitting ducks" for multiple respiratory illnesses, from the common cold to influenza, but the virulence of the SARS-CoV-2 virus and the mortality rate of COVID-19 illness are without modern precedent: in the United States, a country with 331,449,281 persons[7], 33,558,862 cases of COVID-19 and 602,275 fatalities[8] have been reported as of June 22, 2021. These figures indicate that **one in ten** persons contracted the virus in the US, and of those who contracted COVID-19, **one in 56** died from the illness.

This ongoing global health crisis has added a heightened level of urgency to a list of concerns for singers. As noted by this team of authors in a previous article with the same subtitle, that list of concerns includes the COVID-19 *sequelae* most likely to disrupt or permanently damage those functions that are necessary for singing.[9]

The degree to which voice teachers can protect themselves from communicable diseases like COVID-19 begins with the amount of personal agency they wield. Self-employed singing teachers possess a large degree of autonomy regarding their work environment, including the degree and length of time to which they may be exposed to the SARS-CoV-2 virus; so do singers who volunteer for a community or church choir. Notwithstanding the emotionally difficult choices involved with avoidance or complete cessation of singing activities, the fact remains that such people do have choices. Yet teaching faculty at music conservatories or teachers in commercial music companies may have few, if any, choices about their teaching environments.

In anticipation of a return to in-person teaching and learning, a growing number of colleges and universities are requiring vaccination against COVID-19 for faculty, staff, and students who intend to pursue in-person studies on campus this fall.[10] Yet reentry to live interaction for institutionally based teachers and singers is less clear cut than this requirement might suggest, first by allowing vaccine hesitant students to decline the vaccine, ostensibly for health or religious reasons. A number of other factors complicate reentry, including vaccine hesitancy among nonstudent staff and faculty colleagues, changing CDC guidelines and recommendations, foreign students who have had vaccines not authorized by the FDA, and university administrations and commercial studios so anxious to return to in-person teaching and learning to recoup the economic losses of the past year that they have issued directives to employees forbidding them from inquiring about vaccination status among their students and collaborators.

This article aims to provide resources to help singers safely and ethically navigate a return to in-person instruction by considering the following:

(1) Vaccination and Voice Teachers
   - Monitoring Local Levels of SARS-CoV2 Incidence
   - Safety of Vaccination
   - Vaccination and SARS-CoV-2 Variants
(2) Mask Use Recommendations
(3) Aerosol Risk Update
(4) Environmental Risk Factors and Mitigation
   - Risk Factors in Studio Voice Instruction
   - Environmental Risk Mitigation
     — Increasing Air Changes Per Hour
     — CO_2 Meters
     — Air Changes Between Lessons/Rehearsals and Lesson Duration
(5) FERPA, HIPAA, and Vaccine Hesitancy
(6) Psychological Risks Associated with the Pandemic and Reentry
   - The General Psychological Impact of the COVID-19 Pandemic
   - The Physiological Impact of Stress, Anxiety, and Trauma on Voice
   - Resources and Advice in Support of Mental Health
(7) Risk Assessment

VACCINATION AND VOICE TEACHERS

[Disclaimer: the following vaccination information and risk estimates are for Pfizer-BioNTech and Moderna

complete (2 shot) vaccinations. Johnson and Johnson Janssen, AstraZeneca, Sputnik V, and Sinovac vaccines will have differing levels of efficacy against emerging variants. For more information, consult your healthcare provider.]

A high rate of vaccination is the only path toward the safest possible "new normal" within 2021. We can never achieve zero risk for a viral infection that is likely to remain in low levels of circulation for the foreseeable future. However, vaccination can and does render SARS-CoV-2 comparable to many other respiratory infections that we routinely encounter in its likelihood to cause illness or death. Without vaccination, SARS-CoV-2 is without a doubt a far deadlier and more dangerous virus than those other pathogens, such as influenza or respiratory syncytial virus.[11] Safe in-person teaching and learning is best facilitated by high rates of SARS-CoV-2 vaccination in any given community, as this decreases viral spread and the potential creation of variant viruses and lowers the frequency of severe disease.[12]

Voice teachers are at higher risk for *all* viruses that spread through droplets or are in the air because of small studio size and the resultant concentration of exposure to droplets or virus aerosols in that studio.[13] However, because most teach one person at a time, the mathematical odds of exposure for solo voice teachers in any given day, week, or month will remain low (as compared to other higher-population density locations such as public transit or large packed lecture halls). While a small number of vaccinated people can become infected from solo voice lesson settings, an even smaller number is likely to go on to experience substantial disease.[14]

Monitoring Local Levels of SARS-CoV-2 Incidence

There are multiple user friendly resources to monitor the local SARS-CoV-2 incidence (number of infections over a given period of time) and get a sense of one's personal risk of exposure, usually per 100,000 people. A popular source has been the COVID-19 Dashboard provided by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (available at https://coronavirus.jhu.edu/map.html). The *New York Times* has provided similar maps and data about both case incidence and vaccination rates, using the Johns Hopkins data as well as locally sourced data (available at https://www.nytimes.com/interactive/2021/world/covid-cases.html). In addition, many states and counties within the United States have data dashboards, but these are beginning to be removed in some locations; users are advised to check whether the information has been recently updated.

Safety of Vaccination

The technology used in all of the currently approved vaccines in the United States is based on decades of peer reviewed, validated science, including use of mRNA vaccines.[15] The evidence provided from these studies in animals, clinical trials in people for previous vaccines, and the data from hundreds of millions of people now vaccinated is that the risk of an adverse event, or a "severe vaccine reaction" like anaphylaxis or death is less than 0.002%.[16] The annual risk of death in an automobile crash or from a firearm related incident far exceeds this value.[17] All of the published data to date indicate that COVID-19 vaccines approved for use in the United States are safe and effective during pregnancy.[18] The impact of a COVID-19 infection on a pregnant woman, on the other hand, is notable. COVID-19 has been associated with a 25 to 30-fold increase in maternal mortality.[19] Vaccination safely prevents infection and disease in pregnant women. In addition, some antibodies generated by vaccination are found in breast milk, which likely provides some degree of passive, short term protection to breastfed infants.[20]

Vaccination and SARS-CoV-2 Variants

Some SARS-CoV-2 variants of concern may reduce the success rate of vaccinations; this reduction in success has not been confirmed for the Pfizer and Moderna vaccinations.[21] However, if overall hospitalization rates remain low in a community, the composite risk among vaccinated persons is manifestly not different than historical risks we accept from other endemic respiratory viruses, most of which typically cause mild or even moderate self-limited disease in most targets, but which in some instances can cause serious disease (i.e., in those with other health risks). Given that, the opportunity for arts organizations to "return to normal" and "stay open" should not hinge on the presence of a small number of breakthrough cases, even serious ones, but rather on hospitalization patterns. If rates of hospitalization are at historically normal levels and vaccination rates are

high, live performing arts should remain safe. However, if variants emerge that evade the protection provided by vaccines such that there are once again spikes in hospitalization (in any age group), a return to stricter mitigation measures may become necessary.

MASK USE RECOMMENDATIONS

Persons who meet *all* the following criteria do not need to routinely wear masks in indoor group settings: those who are fully vaccinated, who do not have special risks (such as a profound immunocompromised state seen in those who are bone marrow transplant or solid organ transplant recipients who take antirejection medications),[22] and who are living in areas with low COVID-19 incidence, and when the overall majority of the group is greater than 70% vaccinated.[23] While it is possible for vaccinated people to become infected, the likelihood of spread *from* such persons is low,[24] especially in asymptomatic infections (unlike unvaccinated asymptomatic infection, in which spread has been frequently documented).[25] Even though vaccinated individuals with breakthrough infections could theoretically spread the virus to a small number of people, vaccination of any potential contact provides a great deal of protection.[26]

People who are vaccinated, but who have prolonged and frequent exposure to unvaccinated persons, may reasonably choose to wear a mask to prevent breakthrough infection to others. Mask wearing in this setting would be less necessary if unvaccinated persons are required to be routinely tested, with mandatory isolation or quarantine of any people testing positive as well as their contacts and/or in areas of very low incidence of COVID-19.[27] Rapid antigen tests are highly effective in detecting the presence of contagious virus in a test sample and provide information that is available in time to be safely relied upon for decision-making and removal of potentially infectious persons from the group.[28] The CDC and WHO recommend that unvaccinated people continue to wear masks and physically distance themselves when inside with others. Most recently, the WHO has recommended the continuation of mask-wearing by all individuals.[29] As the global public health body, this advice is grounded in the need to prevent spread of new viral "mutants" or variants of concern that can arise in locations with very low vaccination rates globally that may be able to avoid or "escape" the protection provided by immune responses produced by vaccination.[30]

This masking requirement, while most appropriate globally, should be considered necessary indoors in areas of the United States with local/county level COVID-19 vaccination rates of less than 70% of all adults, but is also strongly recommended in crowded locations elsewhere inside and out. It is best practice to have an informal conversation with students and colleagues about vaccination to establish what precautions should be taken to protect all parties. In addition, based on the remarkable downward trends of influenza globally as well as within the United States in the last year due to mask wearing and social distancing,[31] healthcare professionals and public officials are indicating that to prevent having the flu or other serious viral infections (like RSV in small children), they are seriously considering regular mask use starting in the late fall and continuing through the high transmission period of February.[32] Those who sing or are around people singing regularly might also take this into consideration as a wise precaution.

AEROSOL RISK UPDATE

As opposed to direct transmission through a handshake or other direct person to person contact, indirect transmission, and specifically airborne transmission, is now accepted as the dominant form of SARS-CoV-2 transmission.[33] The airborne route occurs during phonation, coughing, sneezing, and certain medical procedures, among other activities. There are three size ranges of particles that contribute to infection transmission: droplets, the largest particles, and by definition greater than 5 microns (μ); medium sized particles of 1 to 5 μ; and small particles of 1 μ or smaller.[34] Airborne transmission can occur by any of these three particle sizes, however the medium sized particles pose the greatest risk, despite the recommended six feet of physical distancing being followed.[35] Room size, the number of infected people in a space, the activity being performed in the room, and room ventilation all play a role in risk of transmission and will be discussed elsewhere in this article.

Large droplets tend to dominate in a cough, as opposed to typical speech. Small particles, less than one μ, carry little virus but can float around for hours. Thus, medium particles contribute to the majority of disease transmis-

sion.[36] Less than five microns in size, the medium particles then dry and shrink in the air, concentrating their viral load as so-called "droplet nuclei" and float for hours in a space, thus creating the need for proper mitigation by those considering using that space.[37]

Breathing, speaking, and singing lead to aerosolization of typically small particles that originate in the bronchioles and alveoli of the lungs. A fluid film burst occurs as we exhale, leading to these small particles being released from the lungs.[38] There is also some evidence that the larynx, the vocal folds, and possibly the oral cavity produce a majority of medium-sized particles through a similar method of fluid film burst, which is why speaking and singing contribute to the viral load in a closed space.[39] When speech or singing is louder, more aerosolization occurs.[40] Lung volume seems to directly correlate with expelled viral load: adolescents and adults have been shown to produce more aerosols than children.[41]

Face masks have been integral in mitigating the spread of the SARS-CoV-2 virus to some extent; however, there is no confirmatory conclusion of this due to conflicting data on the efficiency of wearing face masks to *prevent* the spread.[42] We do know that strict social distancing and wearing masks reduces transmission and thus mitigates risk. Short range airborne transmission, meaning transmission through the air from one person to another, of droplets less than 100 μ likely is more common than typical droplet transmission when distances are 0.2 m or less during normal talking or 0.5 m or less during coughing.[43] Droplets will fall to the floor short of these distances if they are 100 μ or larger, whereas droplets and particles smaller than this size will move through the air to potentially infect another person in proximity.[44] Thus, six feet of distance may not be enough in certain situations.[45]

It has been demonstrated that unmasked transmission can occur farther than six feet apart, up to 10 meters when the infected person is unmasked.[46] As previously discussed, there is some conflicting data on mask use, as it is also demonstrated that two meters of distancing is probably safe if both parties are masked.[47] Small and medium particles can move up to five meters, obviously longer than two meters or six feet of distance. As a caveat to this, Issakov et al. demonstrated that there is a decrease in concentration of particles in the direction of airflow.[48]

ENVIRONMENTAL RISK FACTORS AND MITIGATION

Risk Factors in Studio Voice Instruction

Studio voice instruction consists of one to one sessions between a singing teacher and a student, with the possible addition of a collaborative pianist in the teaching space. While this intimate setting allows artists to explore their potential without public scrutiny, this same intimacy can leave teachers, students, and other collaborators vulnerable to respiratory infections.[49] Singing, and in particular more robust types of singing that feature high sound pressure levels, has been shown to be a high aerosol generating activity.[50] Instruction occurs in various sized venues and ventilation conditions; teachers outside of academia may work in shared studios or in places of residence, while those in academic settings may teach in practice rooms (graduate assistants, adjunct faculty) or faculty offices. In the U.S., no standards exist regarding academic instruction room size; the major accreditation handbook only states "Space allotted to any music unit function must be adequate for the effective conduct of that function," and "All instructional facilities shall be accessible, safe, and secure, and shall meet the standards of local fire and health codes."[51] As such, teachers, students, and pianists may interact in rooms too small for physical distancing measures and with variable or unknown ventilation. Both shared rooms and individual offices have a number of frequently touched surfaces, such as doors, piano keys, music stands, etc., which may serve as fomites. Teachers and pianists usually interact with multiple students per day, often in close succession, with each student having a unique health history and hygiene habits that are often not disclosed to the teacher or pianist.

Environmental Risk Mitigation

Given the previously mentioned conditions, teachers of singing, voice students, and pianists could be considered at greater risk for transmitting the SARS-CoV-2 virus and other upper respiratory contagious illnesses than the general population. However, several relatively low cost changes to the teaching and rehearsing environment

may reduce much of this increased risk. The changes include increasing the number of air changes per hour (ACH) in the teaching or rehearsal space; increasing the amount of outside fresh air brought directly into the room; using HEPA filtration units; using CO_2 meters to track room ventilation in real time; allowing air change time between lessons and rehearsals, and modifying lesson durations according to the vaccination status of the individuals involved and the community infection level. Each of these changes/interventions is detailed below.

Increasing Air Changes Per Hour. Air changes per hour (ACH) is defined as the volume of air added to or removed from a space in one hour divided by the volume of the space.[52] Higher ACH values provide better dilution or removal of potential infectious aerosolized particles, reducing exposure time and therefore lowering risk.[53] Means for increasing air changes include natural ventilation with outside air, recirculated air that is filtered, and the use of portable high efficiency particle air (HEPA) filters.[54] Of these, admitting outside air through the opening of windows or outdoor air dampers is the most desirable,[55] although building design, external temperatures, and local air quality levels may preclude this. Modern buildings typically feature heating, ventilation, and air conditioning (HVAC) systems that introduce fresh air and exhaust a percentage of the recirculated air continuously. In the United States, recirculated air is filtered for particulate removal with no less than a MERV 8 filter.[56] Thus, the stated ACH in public buildings is a mix of fresh air changes and filtered air, with the filtered air considered as equivalent air changes based on the efficiency of the building's filtration.[57] Portable HEPA filtration units also are a viable, cost effective ($100–250 as of July 1, 2021) and flexible means for increasing the total ACH. Filters meeting the HEPA standard must remove at least 99.97% of particles from the air that passes through with a diameter = 0.3 microns, with filtration efficiency increasing for particle diameters smaller and larger than 0.3 microns.[58] HEPA filters thus are theoretically capable of capturing small SARS-CoV-2 viral particles (0.1 microns) as well as medium sized particles and droplet nuclei (<5 microns).[59] A key means to quickly determine the suitability of a HEPA unit for a teaching space is the Clean Air Delivery Rate (CADR). By comparing the HEPA filter's CADR in cubic feet per minute with the room's volume, an equivalent ACH value for the filter can be determined; this can be added to the fresh and recirculated ACH values to determine the total ACH for the space.

CO_2 Meters. Carbon dioxide (CO_2) meters can be used to measure carbon dioxide levels in parts per million in a teaching space. While CO_2 meters are not regarded as providing accurate information about the viral load in a room, they can provide cost effective ($100–165 as of July 1, 2021) real-time information on the fresh air ventilation in a room, which can be an analog of the ACH rate and by extension the ability to dilute or remove potentially infectious aerosolized particles.[60] CO_2 levels rise with poor fresh air ventilation, an increased number of persons in a room, and increased physical activity level of persons in the room.[61] Based on available evidence, the authors recommend a CO_2 level of 800 ppm be used as a threshold level of good air quality. When levels exceed 800 ppm, more fresh air should be admitted.[62]

Air Changes Between Lessons/Rehearsals and Lesson Duration. A final means to make inexpensive environmental changes to reduce infection risk is allowing air changes between lessons/rehearsals[63] and reducing lesson/rehearsal durations.[64] The former provides time for the room ventilation to dilute or remove potential infectious particles, and the latter reduces the total number of particles emitted in a lesson. Teachers and pianists are advised to know the ACH of their teaching/rehearsal spaces. At 6 ACH, one air change occurs every 10 minutes. The authors recommend at least one air change (fresh air or filtered equivalent) after each lesson and advise limiting lesson lengths to 30 minutes if the singer is unvaccinated.[65]

FERPA, HIPAA, AND VACCINE HESITANCY

There are two United States federal laws currently in the forefront of considerations among educators, administrators, studio owners, and others as they prepare for the lifting of COVID-19 restrictions and in-person collaboration. The *Health Insurance Portability and Accountability Act* of 1996 (HIPAA) was created to protect sensitive patient health information from being disclosed without the patient's consent or knowledge. The US Department of Health and Human Services

issued the companion *HIPAA Privacy Rule* to actually implement the requirements of HIPAA, which addresses several issues, including the use and disclosure of individuals' protected health information by entities subject to the Privacy Rule.

> A major goal of the Privacy Rule is to ensure that individuals' health information is properly protected while allowing the flow of health information needed to provide and promote high quality health care and to protect the public's health and well-being. The Privacy Rule strikes a balance that permits important uses of information while protecting the privacy of people who seek care and healing.[66]

The second federal law, the *Family Educational Rights and Privacy Act* (FERPA) protects the privacy of student education records and applies to all schools that receive funds from the US Department of Education.[67] The intersection of these two federal privacy laws is causing confusion for teachers and administrators in the era of COVID-19. It is rather simple to clarify the first of these (HIPAA) for voice teachers. Because HIPAA only applies to specific health care entities such as insurance providers, health care clearinghouses, health care providers and their business associates, voice teachers who do not work in a clinical environment on a medical team should not be concerned with violating HIPAA. If employers, supervisors, or even clients themselves attempt to use HIPAA as a justification to prevent a voice teacher from discussing vaccine hesitancy with voice students, they are in error. The only exception to this is voice teachers who work in a clinical environment.

FERPA is another misunderstood statute in the COVID-19 era. In March 2020, the US Department of Education issued a "Frequently Asked Questions (FAQs)" document to clarify issues about FERPA and COVID-19.[68] First, FERPA only applies to educational records maintained by an institution. Learning about a student's vaccination status through a social media post or casual conversation is not a violation of FERPA. Further, because the US Department of Health and Human Services declared COVID-19 a Public Health Emergency in January 2020, there are emergency provisions under the FERPA "health or safety emergency exception" that allow an educational agency to make determinations on a case by case basis inclusive of the totality of circumstances. Teaching in one on one settings in studios is such a unique setting that a case could be made to share information.

> Under the FERPA health or safety emergency exception, an educational agency or institution is responsible for making a determination, on a case-by-case basis, whether to disclose PII [personally identifiable information] from education records, and it may take into account the totality of the circumstances pertaining to the threat. . . . If the educational agency or institution determines that there is an articulable and significant threat to the health or safety of the student or another individual and that certain parties need the PII from education records, to protect the health or safety of the student or another individual, it may disclose that information to such parties without consent.[69]

Some entities and institutions are issuing policies and guidelines claiming that asking persons (including students) about their vaccination status is a violation of one or both of these US privacy laws; some are even doing this without explicitly using HIPAA or FERPA as justifications, but vaguely referring to potential violations of privacy via "coercive or pressuring behavior." [70]

At best, such policies may be in error, and at worst, are justifications used to wield control over important information and those who have access to it. Communications like these when sent to employees seem to indicate that there are no exceptions, while the reality is that there may be a number of allowable exceptions to privacy laws like FERPA. Indeed, the FERPA "health and safety emergency" exception is the mechanism within which justifiable exceptions are made.

Nevertheless, faculty should exercise sensitivity and diplomacy when inquiring about vaccine status among students, especially in institutional settings. Primarily these are concerns centered on religious and disability discrimination rather than protected health information. Therefore, it is important that singing teachers in each of the following settings fully understand the exceptions provided for under the FERPA "health or safety emergency exception."

Independent studio teachers are not subject to either HIPAA or FERPA, but should establish studio policies based on their setting and personal risk profile. They should know the current age limits for vaccination eli-

gibility and adjust their studio policies accordingly via effective communication with clients, and/or underage students and their parents or guardians, and monitor and enforce their policies when necessary.

Voice teachers and collaborative pianists at institutions without a vaccination requirement should continue promoting vaccination using advocacy messaging provided by their institution or professional associations. The joint statement issued by the NATS Voice Science Advisory Committee, the American Choral Directors Association, Chorus America, the Barbershop Harmony Society, the Performing Arts Medicine Association, the Pan American Vocology Association, Opera America, and the National Collegiate Choral Organization is one example.[71] Almost all institutions have developed elaborate vaccine advocacy campaigns vetted by their legal offices and distributed using print and social media. Therefore, a faculty member may be viewed as an excellent team player by using these resources to advocate that everyone, including their private students, be vaccinated. Faculty should further note that there are multiple ways to discover the status of students while steering clear of privacy concerns; for example, faculty may negotiate vaccine status through an intermediary party, such as their campus student or employee health service who can provide an "all clear" rather than divulge individual's health information.

Finally, it is likely that many teachers already know the status of most of their students either through students volunteering that information in conversation or on social media channels.

Unvaccinated or immunocompromised teachers and collaborative pianists at institutions should contact their Human Resources or appropriate office on campus to negotiate accommodation. It could be possible for such teachers to use the FERPA health or safety emergency exception to justify certain parameters of requested accommodations, such as: knowing the vaccination status of all students they are expected to teach; receiving the institution's assurance of the safest possible work environment in terms of room size, ventilation, masking, lesson length, and/or CO2 monitoring or other factors impacting the safety of the teacher; and establishing protocols for each category of student (vaccinated, unvaccinated, and/or immunocompromised).

Voice teachers and pianists at institutions with a vaccination requirement may view FERPA with minimal concern because the institution is requiring all to be vaccinated. Many of these institutions are allowing exemptions for unvaccinated individuals based on health concerns or religious convictions. In such cases, teachers should work cooperatively to establish protocols for safe teaching in these unique settings as listed below for "Vaccinated teachers at institutions."

Vaccinated teachers and pianists at institutions should realize they are significantly protected by being vaccinated. Nevertheless, due to their unique one on one teaching setting, often in small spaces, teachers in this setting are strongly encouraged to:

- follow the recommendations for "Voice teachers and collaborative pianists at institutions without a vaccination requirement" (above);
- request informed discussions with appropriate authorities on campus;
- prepare for such discussions by studying the FERPA "health or safety emergency exception" (previously referenced in this section);
- start the discussion with the claim that in order to provide a safe environment in these unique spaces, it is vitally important to know the vaccination status of each student they are expected to teach;
- provide a customized solution for each category of student (vaccinated, unvaccinated, and/or immunocompromised);
- mention the FERPA "health or safety emergency exception" as justification for your request of the release of PII (personally identifiable information).

These steps should open the door to discussion to protect the health and safety of all who enter the voice studio.

PSYCHOLOGICAL RISKS ASSOCIATED WITH THE PANDEMIC AND REENTRY

COVID-19 has posed serious direct threats to physical health and general wellbeing, and also has triggered psychological problems for many, including anxiety, depression, and post-traumatic stress disorder. While voice teachers are not (typically) licensed mental health-care providers, we must consider the psychological scars

of the COVID-19 epidemic as we return to in-person instruction. This section will examine the following: the general psychological impact of the COVID-19 pandemic, the physiological impact of stress, anxiety, and trauma, and resources and advice to support singers' mental health.

The General Psychological Impact of the COVID-19 Pandemic

Studies examining the psychological impact of the COVID-19 are emerging. Qiu et al. developed the COVID-19 Peritraumatic Distress Index (CPDI) and used it with a sample of over 53,000 persons in China.[72] They examined the frequency of anxiety, depression, specific phobias, loss of social functioning, and other psychological factors related to the pandemic. Nearly a third of the study's respondents reported symptoms of peritraumatic distress during the pandemic lockdown in China. Similar levels of distress were reported in Italian,[73] French,[74] and Filipino studies,[75] Iranian,[76] and Brazilian[77] studies reported moderate to severe distress in over 60% of their participants. While CPDI levels in many of these studies declined when lockdown periods were lifted, meta-analyses of trauma literature have predictively linked severe levels of peritraumatic distress to subsequent psychopathology. [78]

COVID-19 peritraumatic distress was more severe in certain populations. Studies found that persons 10–30 years of age experienced very high levels of distress,[79] possibly due to their increased consumption of social media[80] and news related to the outbreak.[81] Gender also appears to have been a factor, with female identifying respondents showing significantly higher CPDI scores than male identifying counterparts.[82] Previous studies also suggest that female identifying persons may be more likely to develop posttraumatic stress disorder and may be more generally vulnerable to the effects of stress.[83]

Highly educated persons tended to have more severe COVID-19 peritraumatic distress.[84] American university students experienced high levels of depression (43.3%), high anxiety scores (45.4%), and high levels of PTSD symptoms (31.8%) in a study by Liu et al.[85] They reported that increased levels of loneliness, COVID-19-specific worry, and low distress tolerance were associated with clinical levels of depression, anxiety, and PTSD symptoms.[86] In a study of university students in China, Tang et al. found that extreme pandemic fear was a significant risk factor for peritraumatic distress, followed by short sleep durations.[87] Alqudah et al. found that university students in Jordan experienced severe anxiety (40.6%) and mild to moderate anxiety (23.5%) due to the shift to distance learning, quarantine isolation, and increased student workload.[88]

In short, the COVID-19 pandemic's psychological impact is unprecedented in the modern era; it is global in scope, has received extraordinary documentation due to smartphones and social media, and has created high levels of anticipatory anxiety due to the expected course and spread of the virus.[89] Horesh and Brown suggest it should therefore be treated as a new type of mass trauma, and hypothesize that it has exacerbated existing mental health disorders and created a new wave of stress-related disorders.[90] Persons who are particularly vulnerable include those who are young, identifying as female, university students, and those who frequently consume social media/news concerning COVID-19.[91] This describes the majority of our collegiate singers.

The Physiological Impact of Stress, Anxiety, and Trauma on Voice

The vocal instrument is biological and physiological, and singers' voices are sensitive to the effects of stress. Psychologically, the voice is central to many singers' sense of self,[92] and many find it difficult to decouple "who I am" from "what I do." This point was clearly described by Stohrer.

> Singers are both the instrument and the player. Unable to put the instrument back in its case and leave it in the corner, a singer must carry it around, exposing it to . . . all the current viruses.[93]

When identity and singing are inseparably linked, the loss of performance opportunities can cause considerable distress.

Stress has physical consequences. Prior to the pandemic it was estimated that 50% to 70% of all visits to a physician's office were due to stress related illness.[94] Stress can alter oral and vocal fold secretions, heart rate, and gastric acid production, and is associated with head and neck tension, decreased ability to concentrate, and chronic fatigue.[95] Vocal fold pathologies (e.g., reflux laryngitis and arytenoid irritation) can have etiologies

linked to increased gastric acid secretions caused by stress,[96] and high levels of anxiety may increase the risk of benign voice disorders.[97] Chronic stress has been linked to more dangerous problems such as asthma, depression of the immune system, and myocardial infarction.[98] Making matters worse, the risk of atherosclerotic cardiovascular disease is exacerbated by quarantine conditions due to physical inactivity.[99] Thus, the stressful conditions singers have experienced during the COVID-19 pandemic may have serious long lasting physical aftereffects.

Stress and anxiety can negatively affect control of voice and respiration.[100] Muscular spasms in the larynx have been observed due to the laryngeal nerve's sensitivity to emotional distress.[101] Traumatic experiences (e.g., a global pandemic, the death of a family member, a health/financial crisis) can lead to voice symptoms without underlying physical pathology.[102] Such symptoms were observed in a study of 313 Israeli collegiate professors during the COVID-19 pandemic. The authors found that psychological stress during the transition to online teaching was associated with elevated levels of voice problems. This was especially the case for those who reported high levels of psychological stress.[103] Monti et al. noted that emotional and psychological elements can have a profound effect on a singer's voice, and they encourage singing teachers to be mindful that technical difficulties may have deeply rooted emotional etiologies.[104]

Trauma can also have a profound neurophysiological effect on singers. When the brain perceives a threat to survival (e.g., COVID-19 peritraumatic distress), a "fight/flight/freeze" response may engage that shuts down Broca's area in the left frontal lobe of the cortex.[105] This profoundly inhibits one's ability to put thoughts and feelings into words, and can even mimic the effects of a stroke or other physical lesion.[106] According to polyvagal theory, perceived threats to survival may also produce "a neural dissolution from systems of positive social behavior and social communication,"[107] making it difficult to feel connected to and safe around others.[108] Cues of safety and social engagement may ameliorate these neurophysiological symptoms of trauma.[109]

Singers around the world have experienced trauma and loss related to the COVID-19 pandemic. This trauma may be manifested in social phobias, music performance anxiety, depression, and grief. The authors of this paper hypothesize that epidemic levels of generalized anxiety, music performance anxiety, and depression may be seen in singers during the forthcoming re-entry phase of the pandemic.

Resources and Advice in Support of Mental Health

There are numerous resources now available to support the mental health of singers and teachers of singing. Music performance anxiety (MPA) has been studied extensively in the literature.[110] In *The Musician's Mind: Teaching, Learning, and Performance in the Age of Brain Science,* Lynn Helding presents a useful review of the MPA literature and discusses standard psychotherapies, alternative therapies, and experimental therapies to ameliorate its symptoms.[111]

Depression is a common medical condition to consider when working with singers. Nearly one in five people will suffer from major depression at some point in their lives,[112] and this prevalence may increase following the COVID-19 pandemic. Common speaking voice symptoms of depression include a flat affect, slowed rate of speech, decreased length of utterance, lengthy pauses, decreased pitch variability, mono-loudness, and frequent use of vocal fry.[113] Discussing depression and other mental health issues can be awkward,[114] but singers and teachers of singing are best served when these discussions are normalized. Pedagogues are encouraged to cultivate professional relationships with mental health care providers. As always, "when in doubt, refer out."

Integrating an awareness of and sensitivity to trauma in pedagogic practice may benefit singers as they return to in-person instruction. While trauma awareness initiatives are becoming more common in schools,[115] similar initiatives are generally lacking in higher education.[116] Literature on the therapeutic effects of singing, particularly with survivors of abuse and trauma, is an excellent starting place.[117] Jess Baldwin's "Incorporating Basic Trauma Awareness into the Voice Lesson" also offers readers useful advice.[118] She recommends teachers prioritize self-regulation (see also Van Eekelen et al.), [119] develop a plan and communicate it, establish connection rituals, choose connection over productivity, validate students' feelings, break tasks into smaller segments, show appreciation for effort, focus on positive resources,

and be aware of the student's self-regulation (see also "student self-efficacy" in Crocco and Meyer) [120] while encouraging calm, fun, and connection in the lesson. Additional information on goal setting, journaling, and the use of psychology to build connection in the voice studio may be found in Meyer and Helding's "Voice Pedagogy: Practical Science in the Studio: 'No-Tech' Strategies."[121]

We all likely have experienced pandemic-induced loss. Many continue to suffer the lingering effects of trauma, anxiety, depression, and grief. Singing instructors must consider the psychological scars of the COVID-19 epidemic as we return to in-person instruction, ***because we do not teach voice, we teach people***. When in doubt, refer students and colleagues to mental and medical healthcare providers, and consider building trauma awareness into standard pedagogic practice.

RISK ASSESSMENT

In a 2020 publication written by many of the present authors,[122] several risk assessment tools and a decision assistance tool were provided. Here we provide an updated risk/decision guidance chart (see Table 1 below), which lists a number of moderately priced environmental and behavioral interventions available to the singing instruction community. Two levels of risk are shown, and references are provided for each intervention option. Other resources associated with a June 23, 2021 National Association of Teachers of Singing webinar led by the authors, "Reentry after COVID—Concerns for singers," can be found at https://www.nats.org/cgi/page.cgi/_article.html/Featured_Stories_/NATS_COVID_Resources_Page#webinars.

CONCLUSION

The SARS-CoV-2 pandemic has forced the singing voice community to undergo rapid and substantial change. Responses to the potentially life threatening situation have included several key elements not discussed in this article, chief among them being an explosion of remote learning technologies, a reassessment of instructional delivery methods (including synchronous in person and online teaching as well as asynchronous work), and new or expanded platforms for sharing live performances, all of which were undertaken to reduce the risks associated with close personal contact. As the U.S. and other Western countries continue to expand vaccination and slowly emerge from COVID-19 restrictions, we have reason for cautious optimism.[123] However, as they prepare to return to in-person instruction and performing, teachers, singers, and their collaborators should reexamine the unique risks that they collectively face at this point in the pandemic.

We close with a plea for full vaccination and continued patience (and, as warranted by local conditions, vigilance) by the singing voice community. For those teachers anxious about a return to in-person instruction, we urge actively controlling what can be controlled: first and foremost, one's own vaccination status; next, ensure that the risk level within the teaching environment or rehearsal studio is as low as possible; additionally, take proactive behavioral steps such as those widely in use prior to the availability of the vaccines, such as masking and distancing; finally, open a healthy and productive dialogue with students and colleagues about vaccination and other COVID-19 health issues, including mental/emotional ones. For those teachers who are eager for "business as usual," we suggest that a prudent approach is still warranted. The SARS-CoV-2 virus continues to mutate, and infections remain prevalent among the unvaccinated. There will likely be periods of greater and lesser public health restrictions in the months and years ahead in response to local conditions. We suggest maintaining the many hygiene habits acquired during the last 18 months, especially among the unvaccinated, not only for COVID-19 mitigation, but also for other upper respiratory illnesses that frequently affect the singing voice community. Simple behaviors can make a marked difference in reducing risks to teachers, singers, and collaborative pianists: vaccinate, ventilate, mitigate, and communicate.

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TABLE 1. **Environmental and Behavioral Risk Assessment.**

ENVIRONMENT	At Risk	Safer	Notes	References
Air changes per hour (ACH)	<3	6 or more	More air changes per hour removes aerosols from the teaching/rehearsal space, reducing exposure time not only to potential COVID infections, but also cold and flu viruses.	doi:10.1001/jama.2021.5053
Ability to open windows in teaching space	None	Yes	The ability to bring outside air directly into the teaching space is a key means to reduce the number of possibly infectious aerosol particles in the room.	https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html; https://osf.io/7rczy
HEPA filtration	None	Yes (with a room-size appropriate unit—sufficient CADR for volume of the room)	HEPA filtration can be a cost effective means to increase the number of equivalent air changes per hour in a teaching space that does not have windows.	JAMA and CDC references above; see also https://www.ashrae.org/file%20library/technical%20resources/covid-19/in-room-air-cleaner-guidance-for-reducing-covid-19-in-air-in-your-space-or-room.pdf; https://pubmed.ncbi.nlm.nih.gov/33940414/ https://pubmed.ncbi.nlm.nih.gov/32662746/ https://pubmed.ncbi.nlm.nih.gov/32660218/ https://www.epa.gov/coronavirus/air-cleaners-hvac-filters-and-coronavirus-covid-19 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7711180/ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8084223/
Room size	100 square feet or less (10' × 10')	200 square feet or more (14' × 14')	The ability to distance oneself from another person who is singing depends upon room size. Distancing can reduce exposure risks from directly expelled particles (larger droplets) containing COVID, cold, and flu viruses.	See a calculator tool at: https://indoor-covid-safety.herokuapp.com/; additional calculator available at https://www.mpic.de/4747361/risk-calculator?en; https://www.jvoice.org/article/S0892–1997(20)30245–9/fulltext

(table continues)

TABLE 1. Environmental and Behavioral Risk Assessment *(continued)*.

ENVIRONMENT	At Risk	Safer	Notes	References
CO_2 meter for real-time monitoring ventilation	None	CO_2 meter in singing/ rehearsal studio	CO_2 meters provide a useful real-time analog to the number of local ACH. They do not provide any information about viral load, but they are a useful measure of the ventilation system's removal of expired air.	https://www.medrxiv.org/content/10.1101/2020.10.26.20218354v1.full); https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html; https://pubmed.ncbi.nlm.nih.gov/32028176/; https://www.health.state.mn.us/communities/environment/air/toxins/co2.html; https://www.epa.gov/sites/production/files/2014–08/documents/indoorair20–247.pdf; https://pubs.acs.org/doi/10.1021/acs.estlett.1c00183; https://www.dhs.wisconsin.gov/chemical/carbondioxide.htm
BEHAVIORAL STEPS	**At Risk**	**Safer**	**Notes**	**References**
Vaccination	Teacher, student, and accompanist are not vaccinated	Teacher, accompanists, and students are all fully vaccinated	All three FDA-authorized vaccines are readily available in the US. Vaccination is safe, effective, and free. Annual flu and pneumonia vaccines are also recommended.	https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/pfizer-biontech-covid-19-vaccine; https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/moderna-covid-19-vaccine; https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/janssen-covid-19-vaccine
Entrance screening	No symptom check for all individuals in the teaching/rehearsal space	Teachers, accompanists, and students all self-screen for COVID-19 symptoms before gathering	Screening apps include: https://covid19.apple.com/screening/; https://www.cdc.gov/screening/index.html; https://www.webmd.com/coronavirus/coronavirus-assessment/default.htm.	https://www.doh.wa.gov/Portals/1/Documents/1600/coronavirus/Employervisitorscreeningguidance.pdf; https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html#anchor_1609683211941
Mask usage	None	Yes for all unvaccinated persons	CDC recommendations include masking for all unvaccinated persons when gathering indoors. Vaccinated persons with reduced immune function may be encouraged to continue masking by their physicians. Masks can also reduce the risk of cold and flu virus transmission.	https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/participate-in-activities.html

(table continues)

TABLE 1. Environmental and Behavioral Risk Assessment *(continued)*.

BEHAVIORAL STEPS	At Risk	Safer	Notes	References
Distancing	Guidelines not being followed	6 or more feet for unvaccinated persons	CDC distancing recommendations for vaccinated persons have been removed as of May 16, 2021; for unvaccinated persons, 6 feet or more is still recommended. Distancing can also help reduce the risk of cold and flu transmission.	https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/participate-in-activities.html
Lesson length	greater than 30 minutes	30 minutes maximum with unvaccinated persons	Recommendation based on research at the University of Colorado and the University of Maryland.	https://scholar.colorado.edu/concern/file_sets/9s161736t
Air change time between lessons	None	At least one air change	Increase if an unvaccinated person sings unmasked or if infection rates in community are rising.	doi:10.1001/jama.2021.5053
Aerosol producing activities (lip trills, raspberries, straw in water, vigorous fricatives, etc)	Yes, especially if unmasked or unvaccinated	Not used in lessons, but can be encouraged for solo practice in well-ventilated spaces.	Some SOVTs produce large amounts of droplets; masks may prevent the spread of droplets but not finer aerosols. Some 'singer friendly masks' may permit SOVT use in highly ventilated areas with vaccinated singers only. Vaccination reduces the chance of the singer shedding viral particles. Cold and flu viruses may also be spread through lip trill and raspberry use in group settings.	pending report from Colorado State University Bioaerosol Emission study – See https://smtd.colostate.edu/reducing-bioaerosol-emissions-and-exposures-in-the-performing-arts/
Cleaning common surfaces between lessons	None	Yes, using alcohol or other anti-viral and anti-bacterial cleansers	Reduces the risk of exposure through fomites on hands.	https://www.who.int/westernpacific/emergencies/covid-19/information/transmission-protective-measures; https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public
Teacher and students cleaning hands before lessons	None	Yes, using hot soapy water or alcohol-based cleansers	Reduces the risk of exposure through touching common surfaces and then touching the nose, eyes, and mouth.	https://www.who.int/westernpacific/emergencies/covid-19/information/transmission-protective-measures; https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public
Age of students taught	Unvaccinated adults and children ineligible for vaccination	Vaccinated adolescents and adults	Adults produce more aerosols, but are more likely to be vaccinated; adolescents and children (especially under age 12) are less likely to be vaccinated.	https://journals.plos.org/plosone/article/authors?id=10.1371/journal.pone.0246819

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Dr. Thomas L. Carroll is a surgeon at Brigham and Women's Hospital (BWH) specializing in laryngology and Assistant Professor of Otolaryngology at Harvard Medical School. Since 2014 he has served as the director of the BWH Voice Program, which provides diagnoses and innovative therapies for patients with voice, swallowing, and airway disorders. Dr. Carroll's interest in voice began as a boy chorister at St. Thomas Choir School in New York and continued through a music degree at Oberlin College. He received his MD from Wright State University School of Medicine and completed his residency in otolaryngology at the University of Colorado-Denver and Health Sciences Center. Dr. Carroll completed a fellowship in laryngology and care of the professional voice at the University of Pittsburgh Medical Center Voice Center. Clinical interests include care of the professional voice, early glottic cancer with an emphasis on voice preservation, laryngopharyngeal reflux, and related disorders such as chronic cough, vocal cord paralysis/paresis, and office-based laryngeal surgery, including vocal fold augmentation for both diagnostic and therapeutic purposes and photoangiolytic (KTP) laser therapy.

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Dr. Christine Petersen's scholarly work has focused on the recognition and prevention of zoonotic diseases, primarily the epidemiology and immunobiology of vector-borne and parasitic diseases, and now, SARS-CoV-2. Dr. Petersen is the scientific program chair for the American Society of Tropical Medicine and Hygiene. Her collaborative group works in Brazil, India and Ethiopia via NIH/Fogarty International Center and NIAID-funded studies focused on understanding tranmission and host immune susceptibility for zoonoses. Dr. Petersen's published and patented work demonstrates the ability to target reservoir species for immunologic and parasitologic control of infections to promote disease elimination. As director of the Center for Emerging Infectious Diseases, Dr. Petersen coordinates One Health activities focused on understanding, detecting and preventing emerging zoonotic disease gloablly. Dr. Petersen is a Professor at University of Iowa, College of Public Health, Department of Epidemiology.