

COVID-19 Respiratory Sequelae



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What we are talking about

Breathing for singing
Typical values
Good news/Bad news

Covid-19 respiratory
sequelae (after-effects)

Why should we care?
SARS/MERS comparison
Emerging covid-19 data

The *take home* message

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Spoiler alert: many
persons have lasting
respiratory problems
after COVID-19

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Breathing...

Chi sa respirare, sa cantare



<https://www.pexels.com/photo/mona-lisa-with-face-mask-3957982/>

Breathing...

Chi sa respirare, sa cantare

*One who breathes well,
sings well*

Attrib. Herbert-Caesari, Lamperti, + others

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Breathing...

Chi sa respirare, sa cantare

*One who breathes well,
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**Breathing is
important for singers**

<https://www.pexels.com/photo/mona-lisa-with-face-mask-3957982/>



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Breathing 101

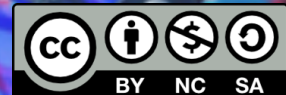
1. Flow

2. Pressure

3. Volumes/capacities



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<https://www.pexels.com/photo/man-holding-microphone-singing-3388900/>

Breathing 101

1. **Flow:** how much air per sec.

TYP 0.1 to 0.2 L/sec.

Phrases usually < 12 sec.

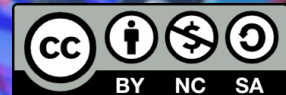
Sing 12 sec. @ 0.2/sec. = 2.4 liters

2. **Pressure**

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2. **Pressure:** force over an area

TYP: 7-35 cm H₂O

10cm H₂O = pressure holding apple

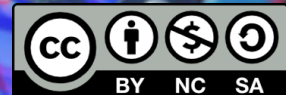
Can go MUCH HIGHER

How we (mostly) control loudness

3. **Volumes/capacities**



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Breathing 101

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How we (mostly) control loudness

3. **Volumes/capacities:** 3-5 L

TYP: Men more than women

Taller persons more than shorter

Younger persons more than older



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Breathing 101

The GOOD news!

More is *not* necessarily better

Small lungs mean short vocal folds (require less airflow)

Sopranos w. big lungs can sing longer phrases than basses with small lungs

The BAD news...

Singers *rely* on breath

Singers don't have more air (TLC) than non-singers (Gould, 1973)

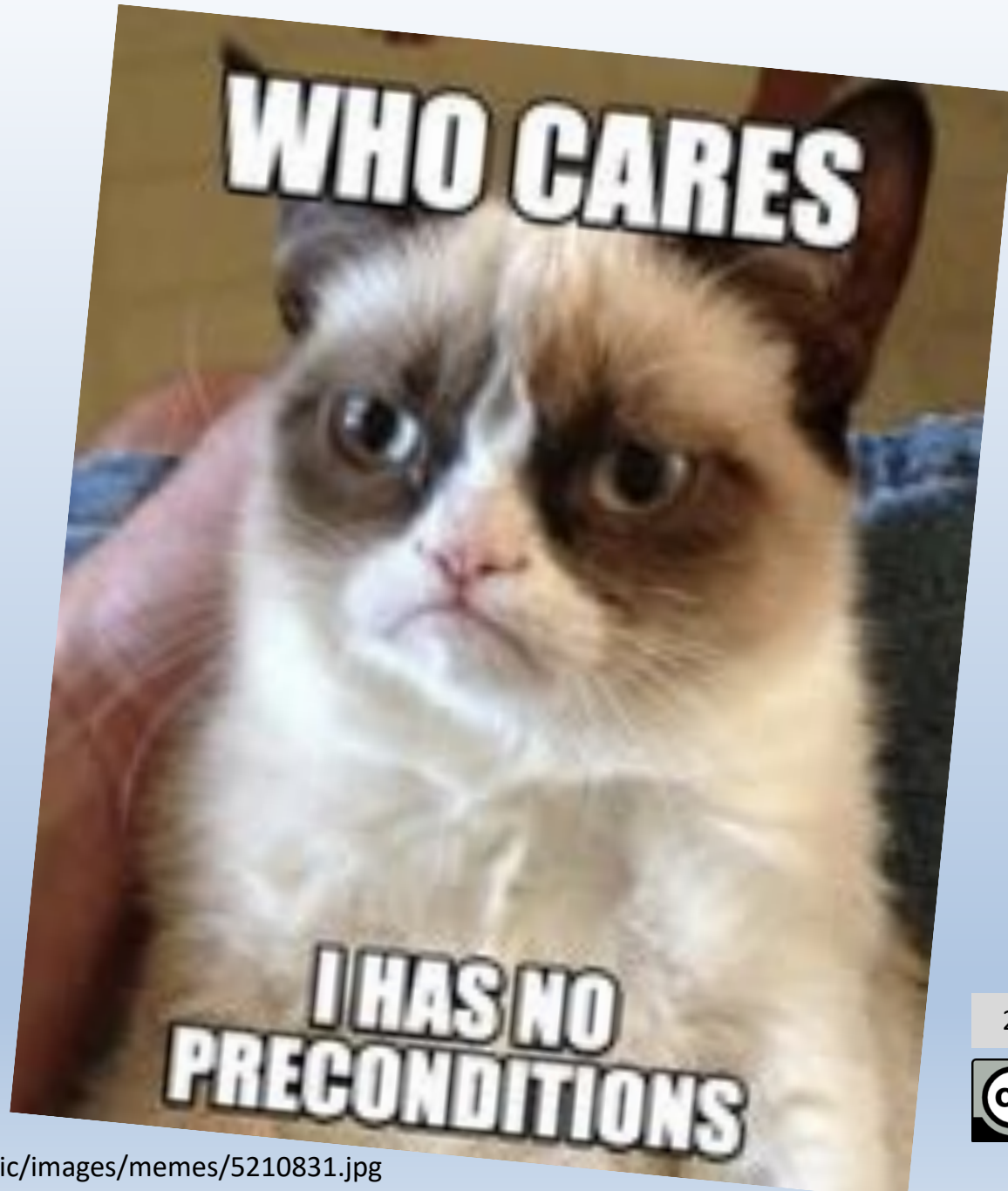
They *use* the breath differently

IF breathing compromised (e.g. illness), singing “costs” more

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Why should I care?



<https://memecreator.org/static/images/memes/5210831.jpg>

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Why should I care?

**Lung disease: COMMON
often undiagnosed**

Over 35 million Americans have
chronic, preventable lung disease
(before COVID-19)

Asthma, Interstitial lung disease, COPD - chronic obstructive pulmonary disease

(Pal, 2017)

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Why should I care?

L1 • COMMON

1 in 10

chronic, 1 (bere

Asthma, Interstitial lung disease, COPD - chronic obstructive pulmonary disease

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Why else should I care?

Smaller ave. lung capacities?

Older, female, shorter (*many NATS members?*)

COVID-19 & respiratory risk

Lung disease: risk  (1 in 10)

Persons w. smaller lung capacities: risk 

Professions requiring optimal respiration

Vocal athletes

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Learning as we go

Few studies on rehab + long-term sequelae

(Barker-Davies et al, 2020)

Not all who catch COVID-19 will be hospitalized (Google)

If you are hospitalized (and recover):

50% chance of requiring ongoing rehab care

(Murray A et al, 2020)

Learning as we go

If you are hospitalized and need the ICU

Possible lasting post-recovery sequelae

Post-intensive care syndrome, aka PICS

breathing, physical, cognitive and psychological problems
(Rawal et al, 2017; Denehy, 2012; Jackson, 2012)

Predictions

Very little data on COVID-19 sequelae

Severe COVID-19 similar to SARS and MERS

Similar to SARS & MERS

Persistent respiratory + other issues > 1 year post recovery

(Herridge et al, 2003; Tansey 2007)

3 SARS studies may forecast COVID-19 respiratory sequelae:

Study 1: 6%–20% of subjects suffered muscle weakness and mild to moderate restrictive lung disease 6–8 weeks post discharge for SARS (Chan et al, 2003)

Study 2: 94 SARS survivors - about a third presented with persistent pulmonary function impairment @ 1-year follow-up. Overall health of these SARS survivors was also significantly worse than the general population. (Ong et al, 2005)

Study 3: 97 SARS survivors - 27.8% had abnormal chest radiograph findings as well as persisting reductions in exercise capacity (6-minute walk test (6MWT) at 12 months (Hui et al, 2005)

COVID-19: similar to SARS & MERS but there are differences (Sheehy et al, 2020)

<https://www.pexels.com/photo/ask-blackboard-chalk-board-chalkboard-356079/>

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What we know

Lasting respiratory issues associated with COVID-19

Pulmonary lesions, alveolar injuries, other probs.

(Tian et al, 2020; Pan et al, 2020)

Many suffer decreased respiratory function post-COVID-19

(Barker-Davies et al, 2020)

Consider:

66 of 70 (94%) COVID-19 patients: *lasting lung damage*
CT scans 2 days before hospital discharge (Wang et al, 2020)
Clumps hardened tissue blocking blood vessels
+ lesions around alveoli

Lesions can cause chronic, long-term lung disease
similar to SARS and MERS (Cox, 2020)

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What we know

Some lung damage will likely gradually heal or disappear

Some lung abnormalities will harden into layers of scar tissue (pulmonary fibrosis)

Scarring stiffens lungs - shortness of breath

Pulmonary fibrosis can limit ability to be physically active

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What we know

*Being asymptomatic w. COVID-19
≠ your lungs are unaffected*



A recent (June 18) study:

37 asymptomatic cases: **57%** showed lung abnormalities on CT
Similar to walking pneumonia (Long et al, 2020)

<https://www.pexels.com/photo/person-holding-covid-sign-3951600/>

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What we know

If I smash my thumb...
A concert violinist ...



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<https://www.pexels.com/photo/black-claw-hammer-on-brown-wooden-plank-209235/>

What we know

If I smash my thumb...

A concert violinist ...

Ave. person: reduced respiratory function *may* not be debilitating
Singers and teachers of singing: can be career-ending

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TAKE HOME MESSAGE

Not everyone will get COVID-19

Not all who get it will need hospitalization

Not all who are hospitalized will have respiratory sequelae
(94% in one study)

Many persons (hospitalized or not) have respiratory sequelae post COVID-19

Asymptomatic persons can suffer COVID-19 lung damage

Not all of COVID-19's respiratory changes will be permanent

Singers power the sound with breath – *vocal athletes*

Small changes in respiratory function may cause a large handicap

For some, career-ending

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Lynn Holding

**NATS Voice Science
Advisory Committee**

Linda Carroll, PhD

Albert L. Merati M.D.

David A. Stoltz, MD, PhD

Johan Sundberg, PhD



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