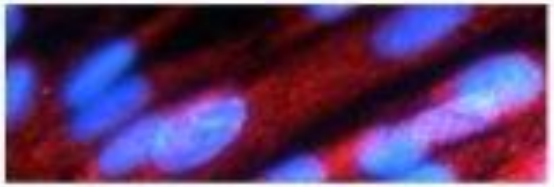
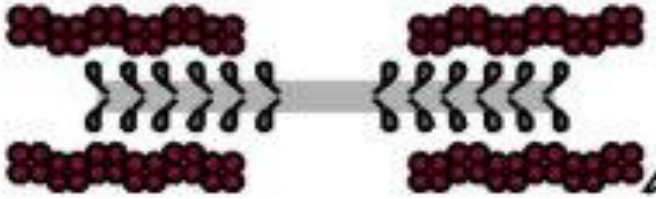


ACAGACACTG
AGAAGGTATT
TGGGGTGTCA



COVID-19 & sport

Henning Wackerhage

Exercise Biology Group

Follow us on Twitter!* TUMExerciseBio
Listen to our Podcasts: Die Sportbiologen

*Our tweets are private tweets by people working in Exercise Biology at TUM. They are not official tweets by the TUM Chair of Exercise Biology.

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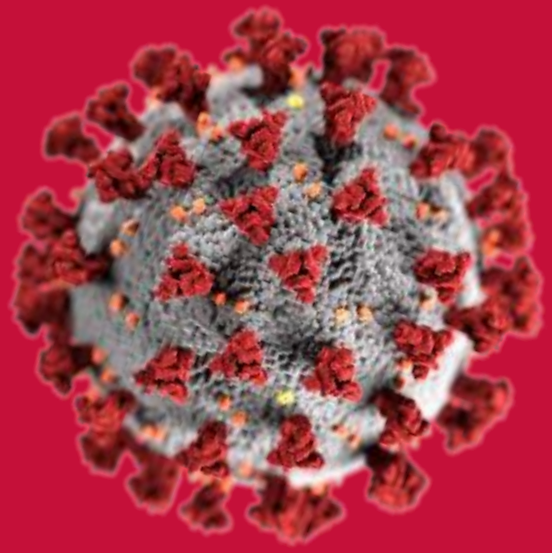
ATHLETE TRAINING MANAGEMENT

What are SARS-CoV-2, COVID-19 and why do we have a COVID-19 pandemic?



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How COVID-19 was first noted

A

ProMED
INTERNATIONAL SOCIETY
FOR INFECTIOUS DISEASES

Published Date: 2019-12-30 23:59:00
Subject: PRO/AH/EDR> Undiagnosed pneumonia - China (HU): RFI
Archive Number: 20191230.6864153

UNDIAGNOSED PNEUMONIA - CHINA (HUBEI): REQUEST FOR INFORMATION
****
A ProMED-mail post
http://www.promedmail.org
ProMED-mail is a program of the
International Society for Infectious Diseases
http://www.isid.org

[1]
Date: 30 Dec 2019
Source: Finance Sina [machine translation]
https://finance.sina.cn/2019-12-31/detail-iihnzahk1074832.d.html?from=wap

Wuhan unexplained pneumonia has been isolated test results will be announced [as soon as available]

B

ProMED
INTERNATIONAL SOCIETY
FOR INFECTIOUS DISEASES

Published Date: 2020-01-08 23:19:25
Subject: PRO/AH/EDR> Undiagnosed pneumonia - China (HU) (07): official confirmation of novel coronavirus
Archive Number: 20200108.6878869

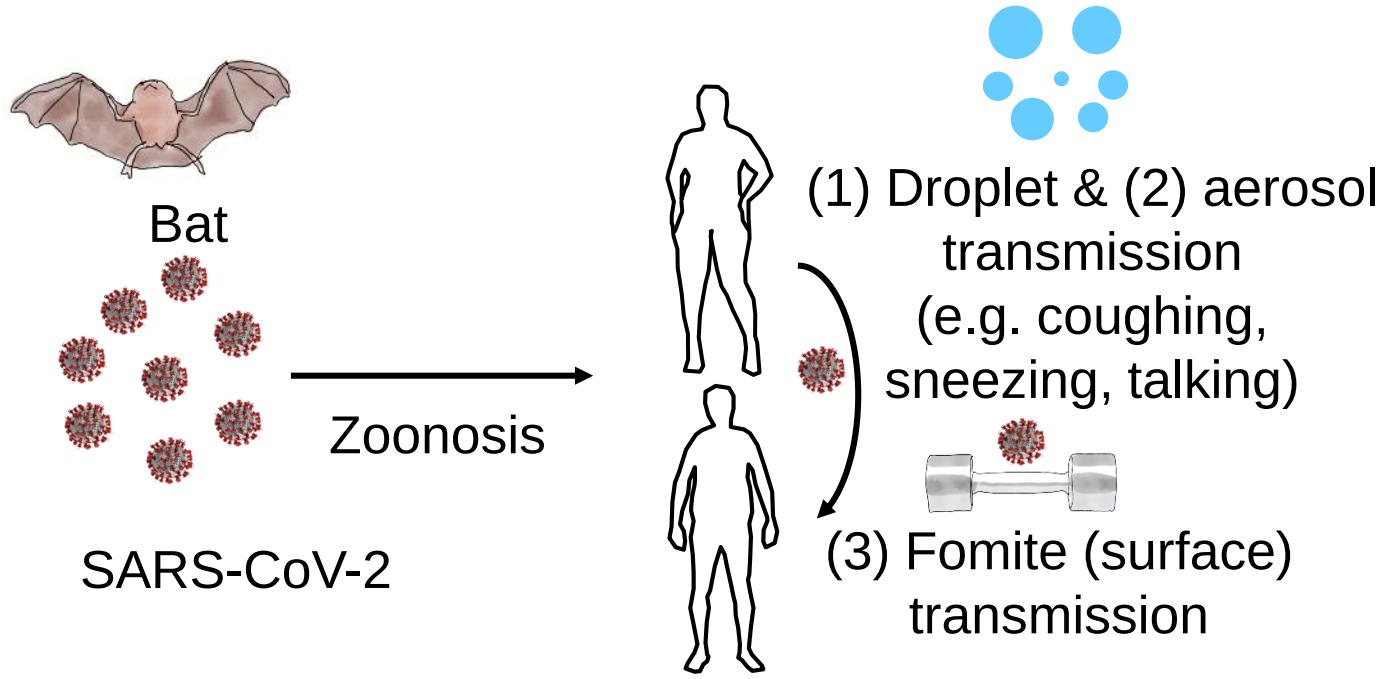
UNDIAGNOSED PNEUMONIA - CHINA (HUBEI) (07): OFFICIAL CONFIRMATION OF NOVEL CORONAVIRUS
****
A ProMED-mail post
http://www.promedmail.org
ProMED-mail is a program of the
International Society for Infectious Diseases
http://www.isid.org

[1]
Date: 9 Jan 2020
Source; CCTV / Xinhua [in Chinese, machine translation]
http://news.cctv.com/2020/01/09/ARTIMxiGSCIHAjC4B1Gy2VcP200109.shtml?spm=C94212.P4YnMod9m2uD.ENPMkWvfnaiV.102

Preliminary progress in pathogen identification of unexplained viral pneumonia in Wuhan
Original title: Experts say that the new coronavirus is an unknown cause of viral pneumonia in Wuhan

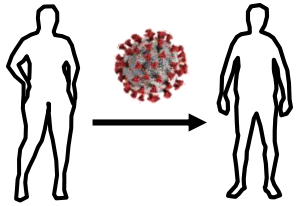
A ProMED post reporting an undiagnosed pneumonia on the 30.12.2019. **B** ProMED post reporting a novel coronavirus on the 09.01.2020.

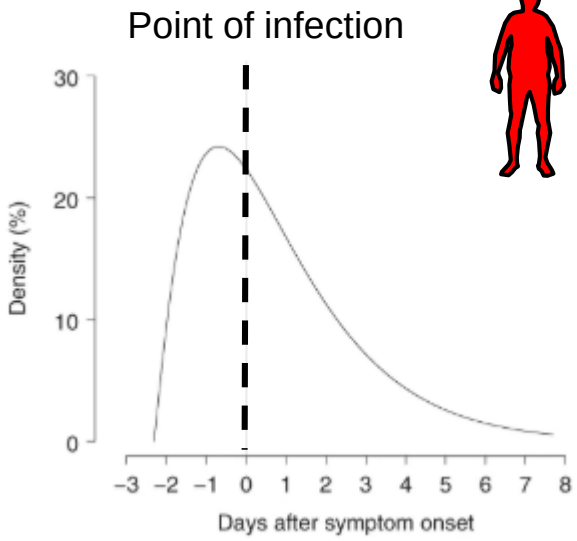
How SARS-CoV-2 moved into humans and how humans infect each other



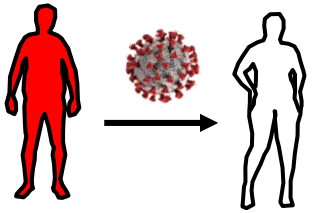
The SARS-CoV-2 coronavirus probably moved from bats into humans (zoonosis). Human-to-human SARS-CoV-2 infections occur via three routes:
1)Droplets ($> 5\mu m$),
2)Aerosols ($\leq 5\mu m$) or
3)Fomite (surface, smear) infections.

Big problem: SARS-CoV-2 infection by asymptomatic subjects





He et al Nature Medicine (2020)



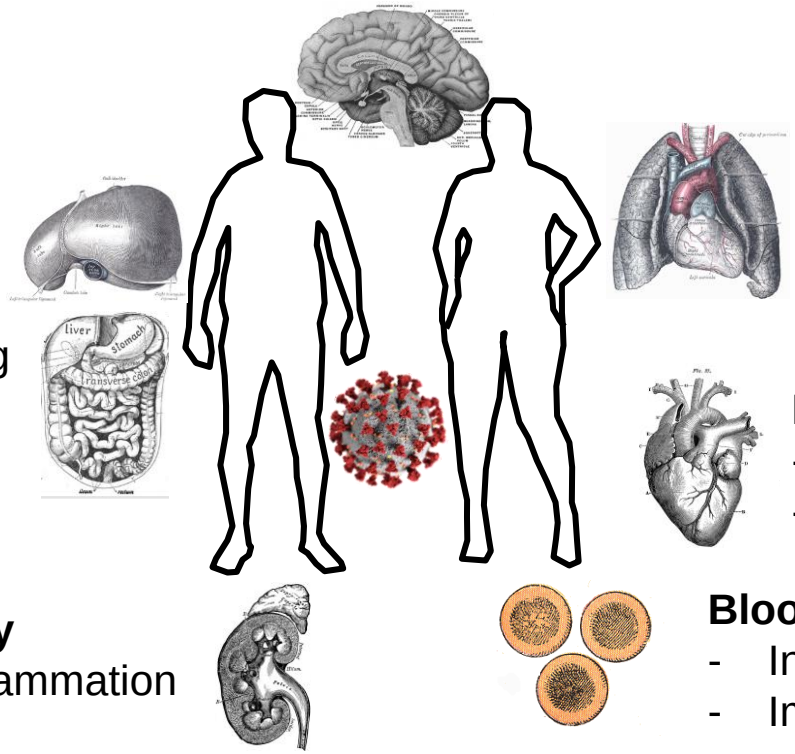
SARS-CoV-2 & COVID-19 symptoms

SARS-CoV-2 but no symptoms

He et al (2020) estimate that 44% (95% CI, 25–69%) of infections occur by presymptomatic individuals and 56% by symptomatic individuals.

COVID-19

Nervous system:
- Inflammation
- Loss of smell and taste



Lungs, airways:
- Alveolar injury, pneumonia
- Cytokine storm
- Hypoxia and ARDS

Intestines & liver
- Diarrhea, vomiting

Heart:
- Acute myocardial infarction
- Myocarditis

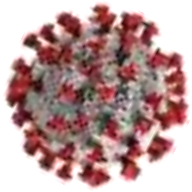
Kidney
- Inflammation

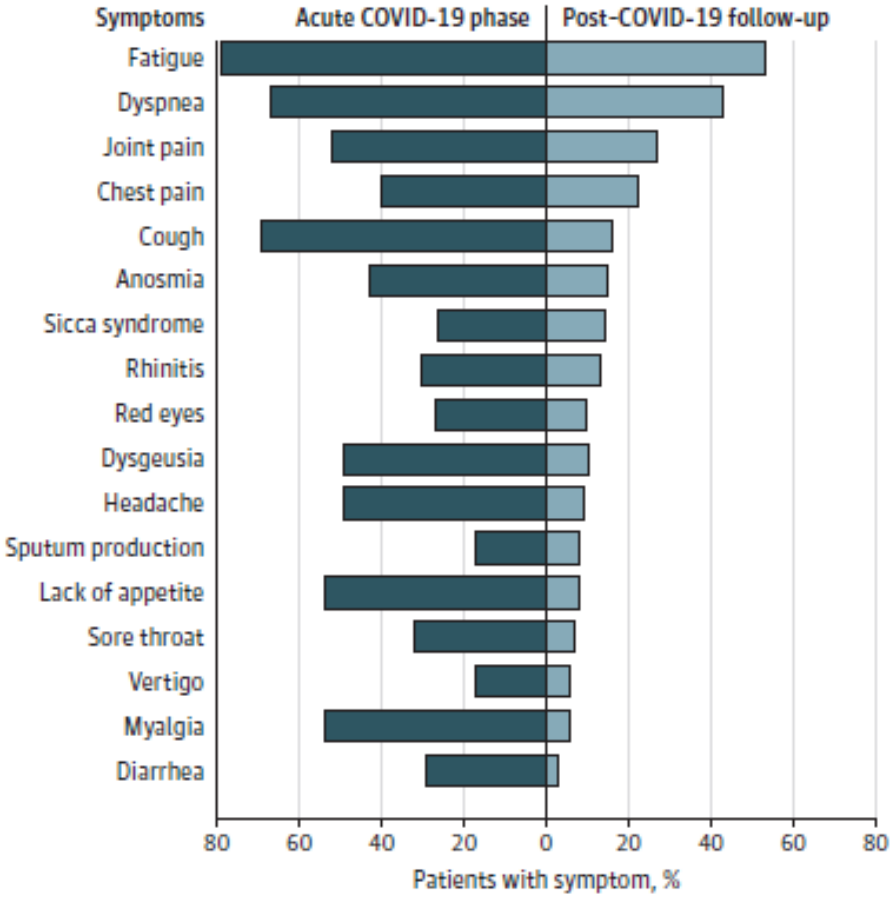
Blood
- Inflammation
- Immuno dysregulation

Modified after Gavriatopoulou Clin Exp Med (2020)

- Many SARS-CoV-2 infected individuals have no or minor symptoms.
- Generally, COVID-19 symptoms are heterogeneous. In the extreme, patients suffer severe pneumonia, Acute Respiratory Distress Syndrom (ARDS), organ failure and death.
- Long COVID: symptoms such as fatigue for weeks and months.

Long COVID





Carfi et al NEJM (2020)

In contrast to many other infections diseases, COVID-19 patients may have long-term consequences. In this Italian study, >80% reported symptoms during a follow-up visit 60±14 days after the onset of COVID-19.

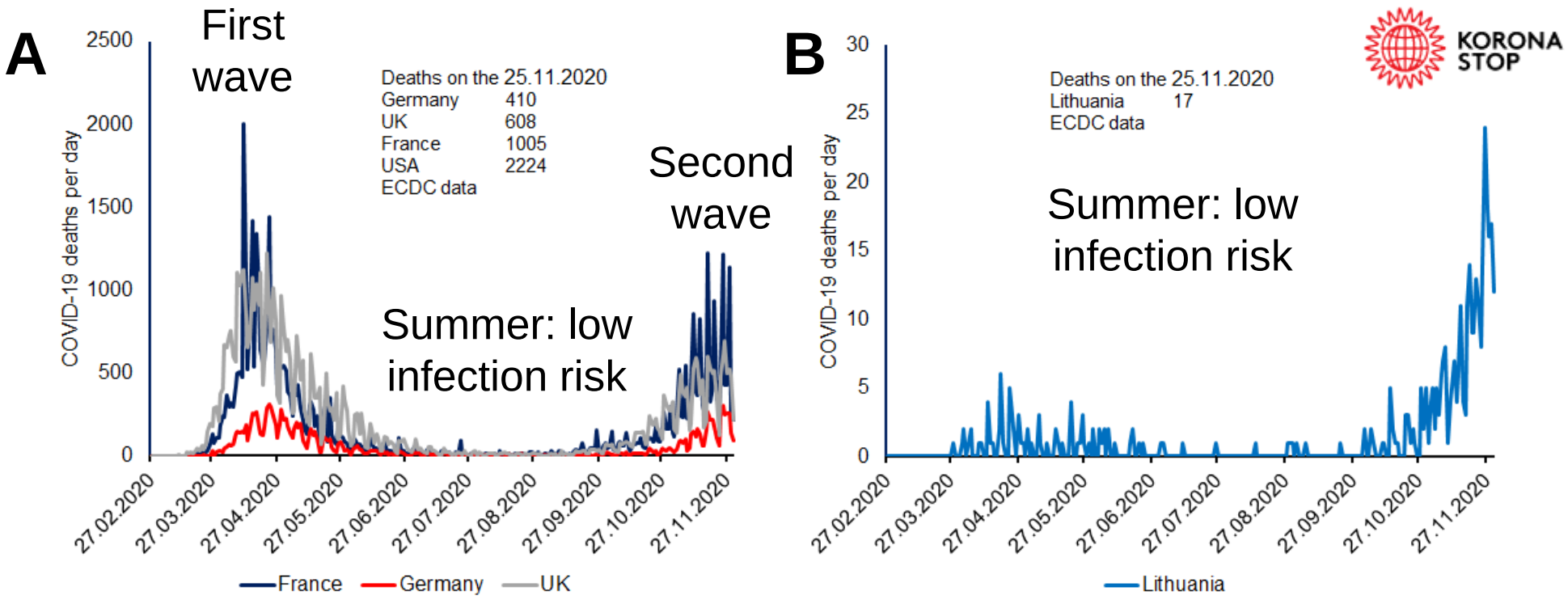
Imperial college report 12 on the 26.03.2020

Imperial College: *We estimate that in the absence of interventions, COVID-19 would have resulted in* ***7.0 billion*** [out of a global population of 7.8 billion] *infections and* ***40 million deaths*** [≈0.5% of cases] *globally this year.* […] *If a suppression strategy is implemented early (at 0.2 deaths per 100,000 population per week) and sustained, then 38.7 million lives could be saved*.

Reality 02.12.2020 with mitigation: 63930654 global cases & 1481580 deaths (John Hopkins Dashboard https://coronavirus.jhu.edu/map.html)

Walker et al. The global impact of COVID-19 and strategies for mitigation and suppression 26.03.2020
https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/covid-19/

Mitigation measures in March 2020



Daily deaths attributed to COVID-19 in **A** Germany, UK, France and **B** Lithuania. These deaths have occurred despite severe mitigation measures. Whilst Lithuania avoided the first wave, it now is part of the second wave. Therefore:

Quarantine in the entire territory of Lithuania from 7 November 2020, 00:00, until 17 December 2020, 24:00.

https://koronastop.lrv.lt/en/news/covid-19-related-restrictions-updated-on-25-november-2020

End game

BIONTECH

Pfizer

moderna

UNIVERSITY OF OXFORD

AstraZeneca

There are now **three effective & safe SARS-CoV-2 vaccines**. First focus is to vaccinate priority groups (suggested by European Commission):

- Health care and long-term care facility workers
- People above 60 years of age
- Vulnerable population (chronic diseases etc)
- Essential workers outside the health sector
- Communities unable to physically distance
- Workers unable to physically distance
- Vulnerable socioeconomic groups and other groups at higher risk

Concerns: Anti Vaxxers, duration of immunity, unknown long-term effects.

Conclusion: Vaccination of vulnerable groups and the advent of spring/summer 2021 will hopefully end the uncontrolled COVID-19 pandemic.

https://ec.europa.eu/health/sites/health/files/vaccination/docs/2020_strategies_deployment_en.pdf

Question & answer

Question: What are SARS-CoV-2, COVID-19 and why do we have a COVID-19 pandemic?

Answer:

- SARS-CoV-2 is a cornavirus that infects the respiratory and other systems and causes a heterogeneous COVID-19 disease.
- SARS-CoV-2 is more infectious than influenca and asymptomatic, infectious individuals can infect others, making it difficult to control the spread of the disease.
- SARS-CoV-2 is seasonal like influenza.
- The development of three effective vaccines may end the current pandemic.

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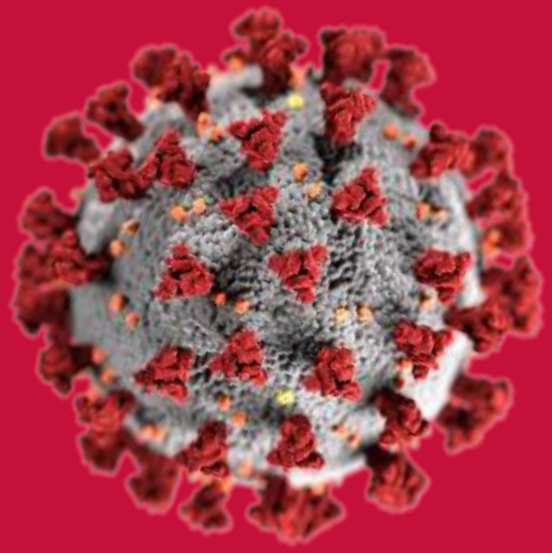
ATHLETE TRAINING MANAGEMENT

What is the effect of SARS-CoV-2 on sport?



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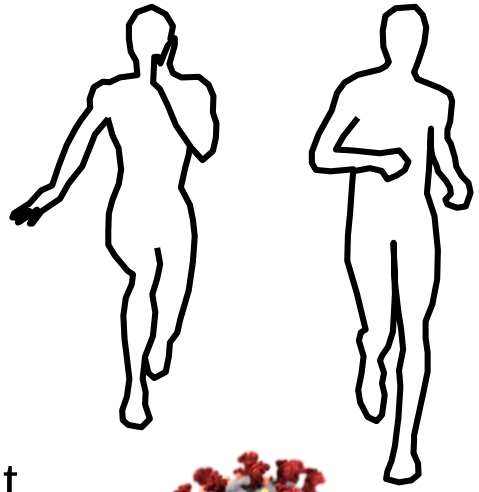
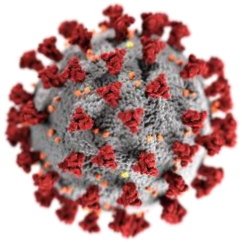
Questions in relation to COVID-19 & sport

What is the risk of SARS-CoV-2 transmission during sport?



Elite sports events (e.g. Bundesliga, Olympic Games Tokio 2020/2021)

How can athletes prevent SARS-CoV-2 infections?

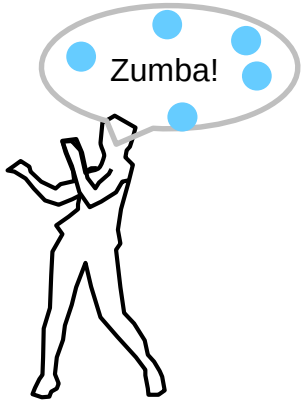


Can you do sport with risk groups?

What is severity of COVID-19 in athletes?

How to return to sport after a SARS-CoV-2 infection?

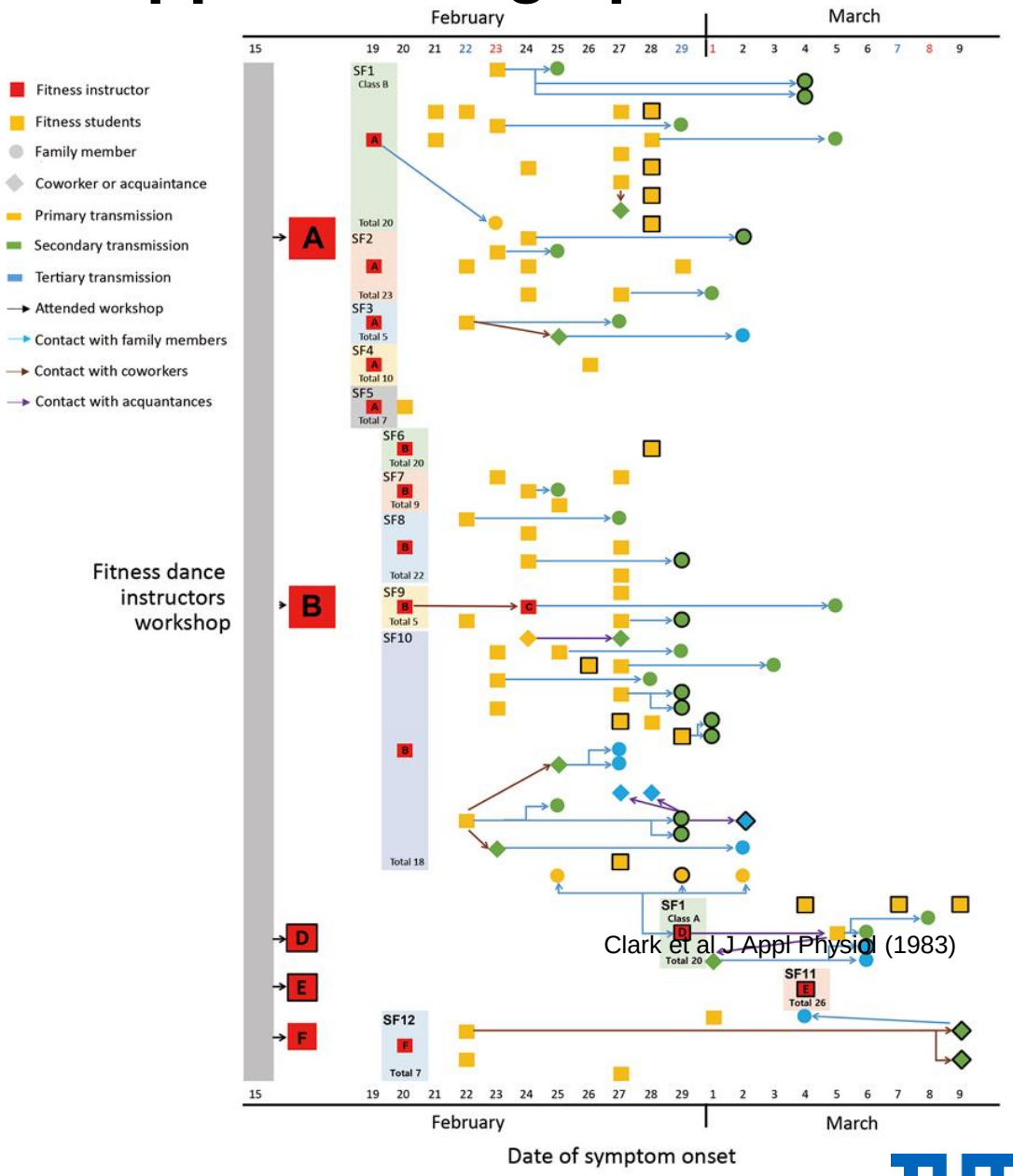
SARS-CoV-2 infections can happen during sport



During fitness dance classes in South Korea, 112 persons became infected. Risk factors are:

- Speaking/shouting → droplet production
- High intensity exercise
- Small venues
- Poor ventiation

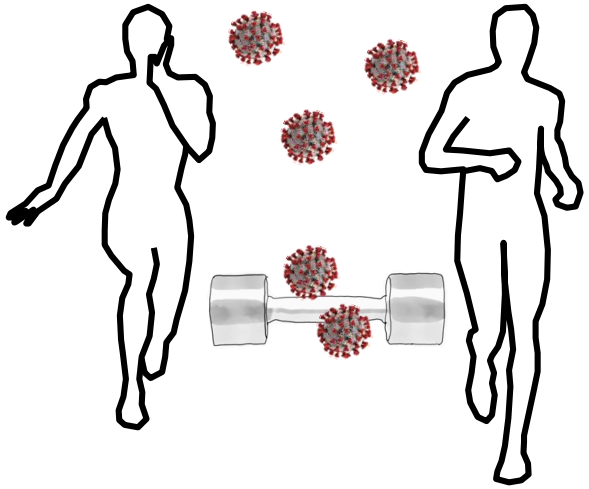
These risk factors can be controlled effectively!



Clark et al J Appl Physiol (1983)

Jang et al Emerg Inf Dis (2020)

How can athletes prevent SARS-CoV-2 infections?



Droplets (> 5µm): Produced during sneezing, couging, talking. **Mitigation**: Social distancing, face masks. No evidence that social distancing 2.0 (e.g. 10 m during running) is necessary outdoors (Bocken unpublished)

Aerosols (≤ 5µm): Float in the air, can build up indoors especially during high-intensity exercise (e.g. Zumba, Spinning), air conditioning. **Big problem indoors!** **Mitigation**: Ventilation, limit people, avoid high intensity exercise

Fomites (surface, smear): e.g. via jointly used sports equipment. **Mitigation**: Hand washing, do not touch face, disinfection

How can athlete prevent SARS-CoV-2 infections?

Several sports developed COVID-19 hygiene strategies allowing to have 2020 seasons without major problems:

- **Soccer:** European soccer leages (e.g. Bundesliga, Premier League, La Liga, Champions league)
- **Cycling:** The three Grand Tours arrived in Paris, Milan and Madrid.
- **Formula**: Full season.

Conclusion: Especially in summer (low SARS-CoV-2 infectin risk) & especially outdoors many sports were able to have a season without unacceptable numbers of SARS-CoV-2 infections or COVID-19 deaths.

How can athletes prevent SARS-CoV-2 infections?

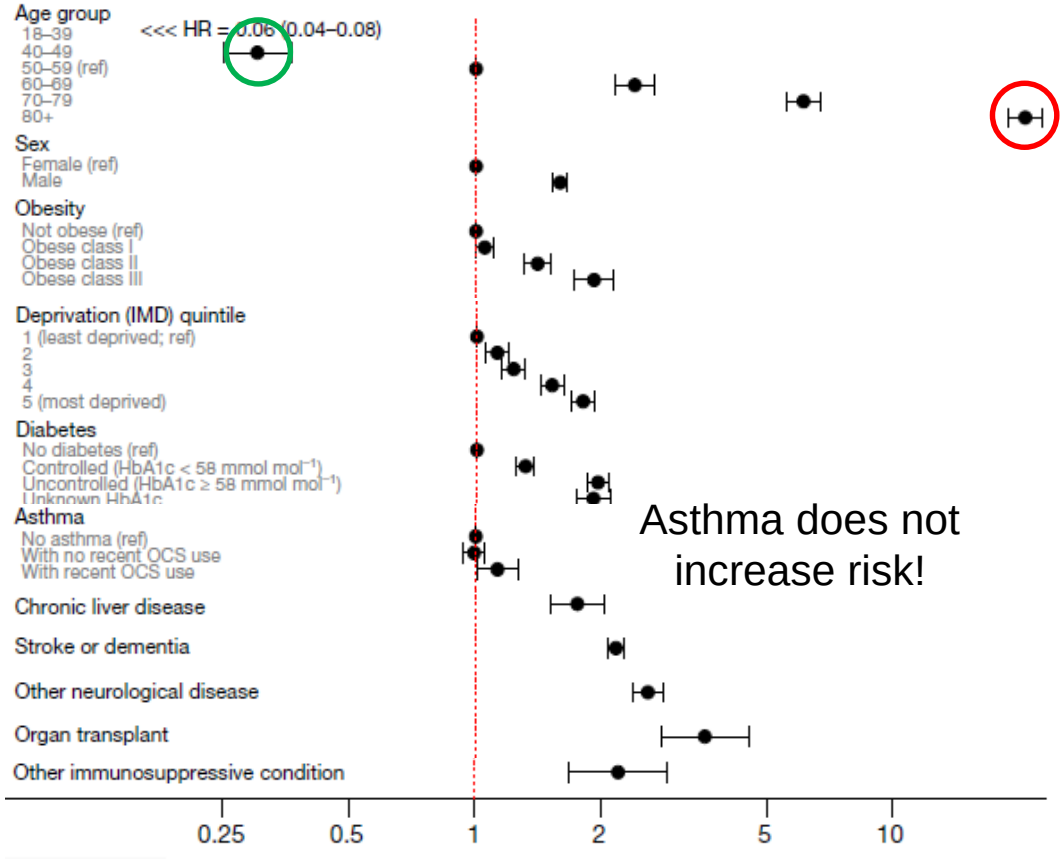
Example: professional football in Germany

1) Registration of COVID-19 cases and severity in all Clubs (players, coaches, support staff, referees).
2) SARS-CoV-2 testing of players, coaches, support staff, referees dependent on infection risk.
3) Mitigation measures to reduce the risk of SARS-CoV-2 infections.
4) Limited number of spectators (mitigation measures linked to infection risk).

Conclusion: Systematic control of SARS-CoV-2 infections via droplets, aerosol and fomites. Reduce indoor time, limit contacts (bubble) and link intensity of SARS-CoV-2 mitigation to infection risk (**traffic light system**).

https://media.dfl.de/sites/2/2020/10/Anhang-I-zur-SpOL-Task-Force-Sportmedizin-Sonderspielbetrieb-Version-4.0-2020-10-29-Stand.pdf

What is the severity of COVID-19 in athletes?



Asthma does not increase risk!

Age is by far the biggest risk factor. Risk of death is 765-times higher in a >80 year old than in a 18-39 year old (age of most athletes).

Williamson et al Nature (2020)

Old age (>60 years of age) is by far the biggest risk factor. Obesity, diabetes, heart and other diseases moderately increase risk.

Conclusion: Most athletes are low risk for severe COVID-19 and death.

Some athletes suffer form severe SARS-CoV-2

Cameron Van der Burgh

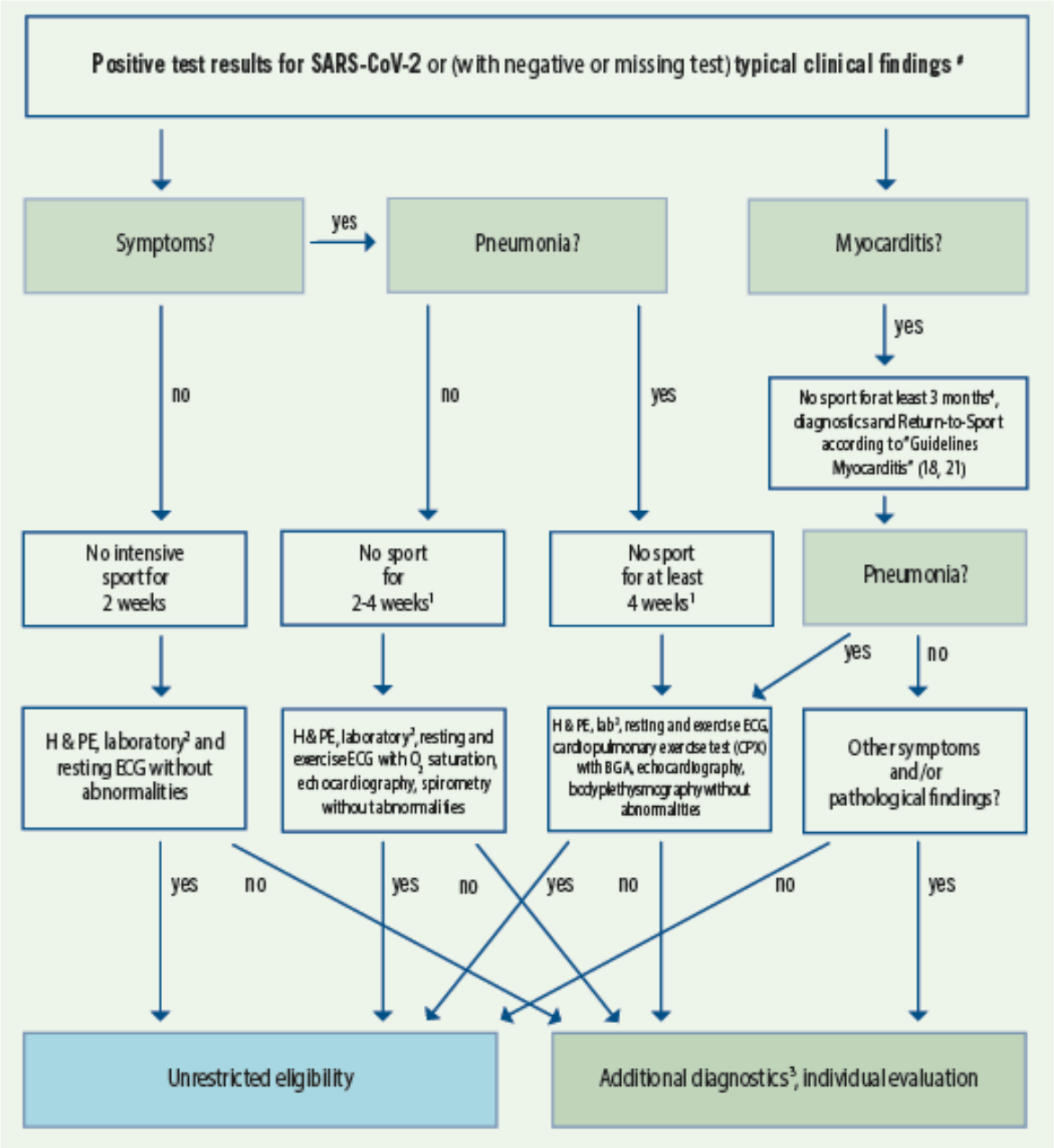
Anecdotes suggest that athletes are not protected from severe COVID-19:

1) “Patient 1” of the Italian COVID-19 outbreak was a 38 year old Marathon runner who spent more than two weeks in intensive care with severe pneumonia (Paterlini, 2020).

2) Mark Stubbs, a fit 28 year old Marathon runner, also required intensive care (ITV, 2020).

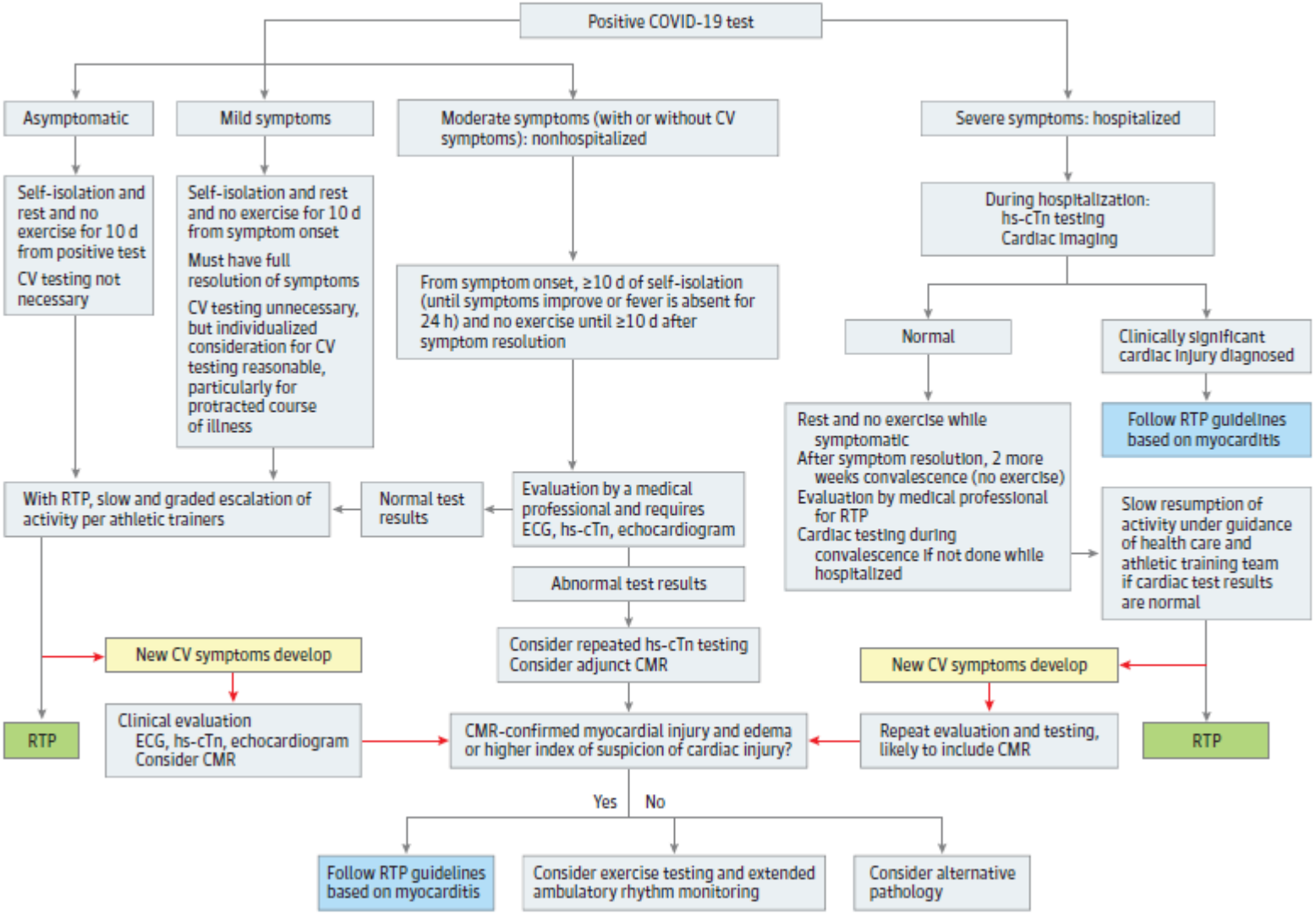
3) Former Olympic Gold & Silver medalist swimmer Cameron Van der Burgh tweeted on the 22.03.2020 that “*I have been struggling with Covid-19 for 14 days today. By far the worst virus I have ever endured despite being a healthy individual with strong lungs (no smoking/sport), living a healthy lifestyle and being young (least at risk demographic)*”.

Return to sport after COVID-19



Niess et al DZSM (2020)

How to return to sport after a SARS-CoV-2 infection?



RTP Return to play

Kim et al JAMA Cardiol (2020)

Question & answer

Question: What is the effect of SARS-CoV-2 on sport?

Answer:

- SARS-CoV-2 sport infections can occur esp. during high intensity exercise indoors, with close contact in poorly ventilated venues.
- Several sports have developed hygiene strategies that allowed competitive events and seasons especially in summer.
- Athletes have low risk for SARS-CoV-2 death but some athletes can have severe COVID-19 or long COVID.
- Return to play/sport protocols guide athletes and their physicians back to sport after a SARS-CoV-2 infection.

Sport in Munich

The End