



NOT Hate Masks; Just Investigate Them Regarding: Fungal Rhino-Sinusitis, Catabolic Myo-Arthralgia, Schoolchildren's Cognition, Sclerosis's Temperature And Disability Sabbatical

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My opinion

Love and hate are powerful words which are often overused to make or break the case for what we love or what we hate. Personally, I have never loved masks even when they now seem "therapeutic" to me against pathogens like SARS-CoV-2 [1-2]. However, I cannot hate their non-physiological micro-environments [3] because the stakes are too high when daily so many are losing lives globally. Therefore, I can only make the case for investigating masks to find the common middle ground for my love-hate relationship with masks because masks may not go away even after pandemic is over. The global population may get acclimatized to the new-normal safety, seemingly provided by masks not only against SARS-CoV-2 but also against other pathogens like seasonal influenza and pathogens causing healthcare associated infections like surgical site infections [4-5].

Is In-Mask Micro-Climate Apt For Fungal Rhino-Sinusitis?

My opinion is: If hot and humid in-mask micro-climate is a given, incidence of new-onset fungal rhino-sinusitis (if any) among chronic mask-wearers should be explored during global pandemic.

Fungal rhino-sinusitis among immunocompetent population is an underexplored avenue [6]. Environmental factors like increased ambient temperature and humidity are risk factors for fungal rhino-sinusitis [7]. Considering that hot and humid in-mask micro-climate is a reproducible fact [3], one of the biggest natural experiments is currently happening globally with masks being worn by global population across all climate zones to contain and mitigate the spread of SARS-CoV-2. As compared to mask use among general population, the quality of worn mask and duration of mask wearing may be much more strenuous and arduous among healthcare workers considering that they have to be at frontline to manage

SARS-CoV-2 pandemic. Therefore, in due course of time, retrospective investigations into still unraveling natural experiment may reveal or refute the increased incidence of fungal rhino-sinusitis among frontline healthcare workers. This may get attributed to the mandated donning of high quality masks for longer durations while working during the pandemic. Before exploring changes in the incidence of fungal infections in other organ systems like respiratory system or upper gastrointestinal tract, the microbiology laboratory-confirmed objective changes in fungal micro-flora (if any) within nasal cavities and paranasal sinuses of chronically-masked frontline healthcare workers may make or break the case for inadvertent effects (if any) on regional micro-biome due to chronic exposure to in-mask micro-climates. The only saving grace may be that N95 masks may filter out most of fungal micro-spores [8], thus blocking the supply of substrates for fungal rhino-sinusitis in spite of hot and humid in-mask micro-climates potentially creating ripe micro-environments for fungal growth. Essentially, incidence of new-onset fungal rhino-sinusitis (if any) should be explored during the ongoing natural experiment of masked global population attempting to mitigate a global pandemic.

Can Masks Induce Catabolic Myo-Arthralgia?

My opinion is: It may be appropriate to qualitatively investigate if in-mask hot and humid micro-climate itself may be providing an apt environment for inducing myo-arthralgia with or without catabolism.

Personal workout benefits with masks are interesting [9]. However, there may be concerns for musculoskeletal wasting among chronic mask-wearers as analogous to chronic pulmonary disease patients [10-12]. For musculoskeletal wasting with chronic pulmonary diseases, one of the proposed mechanisms has been increased work of breathing being related with increased catabolism. Sometimes catabolic states themselves increase work of breathing to meet multiple organs' increased oxygen requirements.

Sometimes increased work of breathing per se increases catabolism within the body when greater percentage of whole body's metabolic energy consumption gets invested into work of breathing itself. One of the organ systems which bear the brunt of this vicious cycle is musculoskeletal system which itself is independently prone to catabolic multisystem disease states [13]. Now the research question worth investigating is whether wearing the masks as mandated to contain SARS-CoV-2 pandemic induces any subjective changes in musculoskeletal systems of chronic mask-wearers, and if masks are inducing subjective musculoskeletal changes, whether these changes can be objectively quantified in terms of catabolic biomarkers' trends among chronic mask-wearers wherein masks' filtering efficiencies and mask-wearing periods' durations may independently confound the results. The catabolic biomarkers for these research investigations can be interleukin-6 and interleukin-1 receptor antagonist which have shown associations with declining muscle functions [14]. The underlying logic for this investigation can be very simple. If masks increase work of breathing, they may be inducing catabolism among chronic mask-wearers, and if masks are inducing catabolism, then they may be inducing musculoskeletal changes as similar to chronic pulmonary diseases. Quantifying the incidence of catabolic myo-arthritis immediately after exhausting periods of chronic mask-wearing can be a good starting point for this investigation. Moreover, to contain musculoskeletal wasting-induced unintentional weight loss that may potentially happen among chronic mask-wearers as similar to unintentional weight loss among chronic pulmonary disease patients [3, 15], it may be important for chronic mask-wearers to consider adjusting their daily calorie intake while mask-wearing has been mandated as a containment and mitigation measure against SARS-CoV-2 pandemic. Interestingly, there has been conflicting evidence whether ambient temperature and humidity changes can themselves induce arthritis. However, future research into myo-arthritis may have to explore more on self-reported qualitative research rather than on inconclusively enumerated quantitative research which tries to convert patients' self-reported words into comparable numerical data that can sometimes lose the essence of whether it understands words or creates data as analogous to qualitative vs. quantitative public opinion polls [16-23]. Therefore, it may be appropriate to qualitatively investigate if in-mask hot and humid micro-climate itself may be providing an apt environment for inducing myo-arthritis with or without catabolism.

Can Schoolchildren Exercise Their Brains In Masks?

My opinion is: It must be explored whether hot-and-humid in-mask micro-climates interrupt schoolchildren's learning.

As analogous to exercising bodies [24-26], schoolchildren are exercising their brains while learning. As heat stress concerns under masks are getting their due recognition [27], these concerns have been raised due to concurrent presence of increased heat production and impaired heat dissipation from exercising bodies [28-29]. Analogously, hot-and-humid in-mask micro-climates may impair trans-nasal heat dissipation from brain while exercising brains concurrently increasing intracranial heat production. Although brain temperatures may physiologically fluctuate during learning [24], the fluctuations beyond critical temperature limits may lead to fatigue and interruption in learning. Therefore, the safety concern about wearing masks while exercising brains must be ascertained in terms of changes (if any) in schoolchildren's performance on cognitive ability tests and in their brain temperatures indirectly assessed via forehead skin or tympanic membrane or brain temperature tunnel [30]. In the interim, cooler indoor classrooms may have to be ensured unless the classrooms can be moved outdoors if air-conditioned indoors are not feasible [31]. If none-of-the-above is possible, virtual classes may be the only option for safe and sound learning among schoolchildren until vaccine or natural herd immunity against SARS-CoV-2 allows schoolchildren to be mask-free again. An alternative innovation can be creating enclosed personal spaces like mask-vacation pods for each student in every classroom wherein schoolchildren can safely doff masks while attending in-person classroom learning [32].

Does In-Mask Temperature Induce Sensitivity Among Multiple Sclerosis Patients?

My opinion is: If multiple sclerosis patients have exacerbations when exposed to hot environments, it may be worthwhile to monitor multiple sclerosis patients for exacerbations during universal mask use mandates because in-mask micro-climate is hot and humid.

In-mask micro-climate is hot and humid which may

increase airway and/or brain temperature due to attenuated heat dissipation [3, 33]. The question is whether this hot and humid micro-climate has implications in multiple sclerosis and heat-intolerance [34]. Multiple sclerosis patients have exacerbations when exposed to hot environments [35]. These exacerbations are said to correlate primarily with increased core temperature and sometimes with increased skin temperature. However, it has not been investigated whether increased airway and/or brain temperature can induce these exacerbations [36-37]. Therefore, to objectively document effects of hot and humid in-mask micro-climate among heat-intolerant populations, it may be worthwhile to monitor multiple sclerosis patients for exacerbations during universal mask use recommendation. However, even if exacerbations are irrefutably discovered among multiple sclerosis patients donning masks for long durations at their life-sustaining jobs, heat-intolerant populations may not be exempted from universal mask use during COVID-19 pandemic [38]. Therefore, for relishing mask-free stay at home while donning masks for shortest duration possible during limited instrumental activities of daily living, "disabling" heat-intolerance and exacerbating multiple sclerosis may get pled as potential grounds for paid "vacations" from jobs which cannot be performed remotely during COVID-19 pandemic.

Is Physiological Mask Intolerance A "Disability"?

My opinion is: Physiological mask intolerance in extremes may warrant unpaid sabbatical unless it gets recognized and covered as a "disability".

Neither commoners nor experts seem to understand physiology of mask intolerance. They debate about masks affecting biochemistry of respiratory oxygen and carbon dioxide level and biomechanics of respiratory air pressure and flow which all may be playing comparatively minor roles as regards to mask intolerance [39-41]. However, they are not realizing that masks which are blocking pathogens from getting exhaled into and inhaled from the ambient environments become intolerable as they are creating encapsulated exhaled heat-and-moisture micro-environments which interfere with brain-cooling role of nasal airflow naturally happening to-and-fro at ambient temperature and humidity [3, 42]. Therefore, the educated discussions about mask intolerance hereafter should be how far the masks may interfere with mask wearers' mental faculties secondary to

ensued thermal stress on individuals' brains [43-46]. Although extracranial "cooling" of brain may be ensured either by air-conditioning ambient environment's temperature to colder level or by actively cooling head with devices like cooling headband [47], intranasal cooling may come out to be faster and superior because underlying noses are to the overlying brains as underlying fans are to the overlying motherboards with involuntary respiratory airflow around-the-clock in the nose actively keeping brain cooler in a better ceaseless way [48].

Essentially, it is a given that mask intolerance is a physiological entity and not a pathological disease which make the calls for mask exemption moot in themselves [38]. However, the question is whether this physiological entity itself can be called a disability per the definition provisioned under the Americans with Disabilities Act of 1990 (ADA) and the Americans with Disabilities Act Amendments Act of 2008 (ADAAA) [49-52]. However, this "impossible" inclusion of physiological mask intolerance under the purview of ADA/ADAAA may only ensure the nondiscrimination of "disabled" but not the compensation for "disabled" due to overlapping and confusing terminologies [53-54]. Therefore during the surging and resurging COVID-19 pandemic, unpaid sabbatical may be the best option for those whose physiological intolerance to masks is severely accentuating thermal stress on their brains secondary to the warranted mandatory mask use. It may be only in due course that this physiological intolerance to masks may make a case to potentially fulfill the criteria as defined under "disability" and "direct threat" by ADA, but that has not happened yet [55-56].

Conclusion

Summarily, masks seem to give us so many reasons to love them and yet so many reasons to hate them but masks are actually just expecting us to investigate them so that we neither love nor hate the mandated donning of masks.

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