

Adverse Collateral Effects From Wearing Facemasks: >90 Studies

Note: This list is by no means exhaustive. Many studies cover multiple topics and so appear in more than one column. Studies in bold are particularly noteworthy in that category.

Respiratory/Cardiovascular Burden

Dyspnea, decreased oxygen, increased carbon dioxide, increased respiratory rate, increased airflow resistance, increased blood pressure, and increased heart rate.

Infection Control Hazard

Infection Control Hazard through cross-contamination, risk compensation, pathogen retention, enhanced bacterial and fungal growth on or under the mask, and/or increased viral viability duration.

Psychological Harms

Adverse user experiences, anxiety, sleep disturbance, concentration difficulty, interpersonal and relational impairment.

Headaches

Range from minor to migraine; both *de novo* and exacerbation of pre-existing headaches. Severity increases with mask quality. Includes associated symptoms of nausea, dizziness, tachypnea, palpitation, fatigue, and cognitive impairment.

Skin Damage

Includes physical irritation and trauma (e.g. itch, ulceration, desquamation, fissure, etc.), allergic reactions (e.g. contact dermatitis), and exacerbation of bacteriogenic dermatological issues (e.g. acne, some types of seborrheic dermatitis).

Heightened Fatigue

Includes increased exertion, more rapid fatigue, dizziness, drowsiness, and outright exhaustion.

Other

Includes other adverse secondary effects such as: communication impairment; rhinitis and vocal disorder; local changes to skin humidity and temperature; ophthalmic irritation and intraocular pressure increases; increased COVID-19 case fatality rate.

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16. Lassing, J., et al., Effects of surgical face masks on cardiorespiratory parameters during steady state exercise. *Sci Rep*, 2020. 10(1): p. 22363.

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Chart Annotated from: Lassing, J., et al., Effects of surgical face masks on cardiopulmonary parameters during steady state exercise. *Sci Rep*, 2020. 10(1): p. 22363.

	Control (no mask)	Surgical Mask	p-value	n _p
Forced Expiratory Volume				
FEV ₁ (l)	4.66 ± 0.61	4.18 ± 0.69	<0.001*	0.84
Peak Expiratory Flow				
PEF (l·min ⁻¹)	9.50 ± 1.19	8.07 ± 1.25	<0.001*	0.71
Airway Resistance				
RAW (cmH ₂ O·l ⁻¹ ·s)	0.32 ± 0.08	0.58 ± 0.16	<0.001*	0.79
Vital Capacity				
VC (l)	6.00 ± 0.72	5.65 ± 0.85	<0.001*	0.82

Table 1. Results of body plethysmography. The values are given as means and standard deviations. Co control; SM surgical mask; FEV₁ forced expiratory volume in 1 s; PEF peak expiratory flow; RAW airway resistance; VC vital capacity; n_p partial eta squared. *Significant differences from the control.

Forced Expiratory Volume, Peak Expiratory Flow, and Vital Capacity all experienced significant decline with Surgical mask use while Airway Resistance increased.

	Co	SM	p-value	n _p	DDET
Pulmonary parameters					
VC (ml·min ⁻¹ ·kg ⁻¹)	34.80 ± 5.79	33.05 ± 4.96	0.04*	0.31	44.79 ± 9.12
VC _{0.1} (ml·min ⁻¹)	34.85 ± 2.78	33.75 ± 3.18	0.04*	0.30	39.58 ± 5.60
VC _{0.2} (ml·min ⁻¹)	82.42 ± 10.66	77.85 ± 9.26	0.001*	0.61	141.83 ± 22.73
V _E /V _T (l·min ⁻¹ ·l ⁻¹)	29.34 ± 4.41	28.50 ± 3.42	0.19	0.14	38.75 ± 7.12
V _E /V _T (l·min ⁻¹ ·l ⁻¹)	30.80 ± 3.81	30.01 ± 3.33	0.26	0.10	35.90 ± 3.87
V _E (l·min ⁻¹)	60.88 ± 7.48	57.38 ± 6.55	0.01*	0.42	102.65 ± 17.71
T ₁ (s)	0.89 ± 0.14	1.01 ± 0.13	<0.001*	0.73	0.63 ± 0.11
T ₂ (s)	0.98 ± 0.21	0.95 ± 0.17	0.14	0.17	0.66 ± 0.17
V _T (l)	2.49 ± 0.35	2.45 ± 0.36	0.48	0.08	2.98 ± 0.59
RR (b·min ⁻¹)	34.03 ± 2.29	32.89 ± 5.40	0.02*	0.37	40.08 ± 11.23
Hemodynamic parameters					
SBP (mmHg)	172.3 ± 15.8	177.2 ± 17.6	0.33	0.08	210.4 ± 26.9
DBP (mmHg)	74.6 ± 4.4	72.3 ± 9.1	0.20	0.13	77.5 ± 13.7
CO (l·min ⁻¹)	25.93 ± 4.04	28.59 ± 3.94	0.00	0.27	32.06 ± 4.62
SV (ml)	168.4 ± 30.87	178.8 ± 25.67	0.22	0.12	176.02 ± 26.91
HR (b·min ⁻¹)	154.5 ± 11.4	146.1 ± 11.2	0.001*	0.59	148.39 ± 11.4
CV (l)	23.09 ± 2.05	31.86 ± 0.70	0.14	0.17	37.04 ± 2.994
arVO ₂ (%)	11.1 ± 1.84	9.59 ± 1.44	0.02*	0.38	11.74 ± 2.13
LACΔ (mmol·l ⁻¹)	4.27 ± 1.46	4.71 ± 1.42	0.26	0.11	9.01 ± 1.79
REK	0.95 ± 0.05	0.95 ± 0.05	0.97	-	1.08 ± 0.11
RPE (1-10)	6.6 ± 1.1	6.9 ± 1.1	0.16	0.16	10
SO ₂ (%)	95.22 ± 0.71	95.24 ± 0.83	0.73	0.01	-
Mean power output (Watt)	200.7 ± 26.0	1.0	-	-	100.71 ± 40.52
Exercise duration (min)	30 ± 0	30 ± 0	1.0	-	-

Table 2. Mean values with and without SMs during the 30 min continuous tests (n = 13; excluding the warm-up and recovery phases). Values are given as means and standard deviations. The values are presented as means and standard deviations. **DDET** double incremental exercise tests; **Co** control; **SM** surgical mask; **IET** incremental exertion test; **VO₂** oxygen uptake; **V_E** CO₂ carbon dioxide production; **V_T** minute ventilation; **V_E/V_T** refers to the number of liters of ventilation per liter of oxygen consumed; **V_E/V_T** CO₂ refers to the number of liters of ventilation per liter of carbon dioxide; **V_E** alveolar ventilation; **RR** respiratory rate; **V_T** tidal volume; **T₁** inspiratory time; **T₂** expiratory time; **SBP** systolic blood pressure (5-min interval); **DBP** diastolic blood pressure (5-min interval); **SV** stroke volume; **CO** cardiac output; **HR** heart rate; **arVO₂** arteriovenous oxygen difference; **REK** respiratory exchange ratio; **LAC** blood lactate concentration (5-min interval); **SO₂** % oxygen saturation; **RPE** rating of perceived exertion (5-min interval); n_p = *Significant differences from control.

Discussion

The main finding of this randomized crossover study was that the use of SMs during constant exercise was associated with significant changes in the values of the pulmonary and cardiovascular parameters without the use of face masks (Figs. 3 and 4). Body plethysmography revealed a two-fold higher R_{aw} when masks were used. However, the VO₂ and arVO₂ was reduced when SMs were used.

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