

EVALUATION OF SIMPLIFIED MECHANICAL POWER AND DISSIPATED ENERGY CALCULATIONS IN PHYSICAL RESPIRATORY MODELS WITH TISSUE AND AIRWAY RESISTANCE

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Increase in P_{peak} , R_{aw} and P_{mean} due to tissue resistance and increase in flow resistance with no effect on P_{plat} and C as shown in Table S1.

Table S1: Average parameters determined from pressure waveforms and set ventilation parameters for each model of the respiratory system.

Model of the respiratory system	P_{peak} (cmH ₂ O)	P_{plat} (cmH ₂ O)	C (mL·cmH ₂ O ⁻¹)	R_{aw} (cmH ₂ O·s·L ⁻¹)	P_{mean} with insp. hold (cmH ₂ O)
No-resistance	38.07	36.35	27.5	2.02	19.62
Flow resistance 5	41.38	36.46	27.4	5.79	19.99
Tissue resistance	41.30	36.52	27.4	5.62	20.33
Tissue + Flow resistance 5	44.26	36.40	27.5	9.25	20.84
Tissue + Flow resistance 10	47.51	36.40	27.5	13.07	21.33
Tissue + Flow resistance 15	51.1	36.40	27.5	17.29	22.42

Increase in mechanical energy (E) due to tissue resistance and flow resistance calculated by different simplified E calculation methods based on the obtained ventilation parameters (Table S2).

Table S2: Calculated average mechanical energy delivered to the model of the respiratory system by different simplified methods of E calculation based on the obtained ventilation parameters.

Model of the respiratory system	Simplified methods of E calculation for volume-controlled ventilation (J)				
	Gattinoni eq. (2)	Comprehensive eq. (3)	Dynamic eq. (4)	Surrogate eq. (5)	Chi eq. (6)
No-resistance	2.34 ± 0.03	2.19 ± 0.04	2.11 ± 0.03	2.58 ± 0.03	3.37 ± 0.07
Flow resistance 5	2.47 ± 0.01	2.51 ± 0.02	2.27 ± 0.01	2.74 ± 0.01	3.44 ± 0.02
Tissue resistance	2.46 ± 0.01	2.50 ± 0.01	2.27 ± 0.01	2.74 ± 0.01	3.51 ± 0.02
Tissue + Flow resistance 5	2.58 ± 0.01	2.80 ± 0.02	2.41 ± 0.01	2.89 ± 0.01	3.61 ± 0.02
Tissue + Flow resistance 10	2.70 ± 0.01	3.12 ± 0.01	2.57 ± 0.01	3.05 ± 0.01	3.71 ± 0.02
Tissue + Flow resistance 15	2.84 ± 0.01	3.47 ± 0.01	2.75 ± 0.01	3.23 ± 0.01	3.92 ± 0.03

The effect of inspiratory hold on P_{mean} and E calculated according to Chi et al. [11] for models of the respiratory system with tissue and different flow resistances (Table S3, Table S4).

Table S3: P_{mean} determined from pressure waveforms with/without inspiratory hold for each model of the respiratory system.

Model of the respiratory system	P_{mean} without inspiratory hold (cmH ₂ O)	P_{mean} with inspiratory hold (cmH ₂ O)
No-resistance	9.51	19.62
Flow resistance 5	10.11	19.99
Tissue resistance	10.10	20.33
Tissue + Flow resistance 5	10.72	20.83
Tissue + Flow resistance 10	11.35	21.33
Tissue + Flow resistance 15	12.09	22.41

Table S4: Calculated average mechanical energy delivered to the model of the respiratory system with/without inspiratory hold according to Chi et al. [11].

Model of the respiratory system	Without inspiratory hold eq. (6)	With inspiratory hold eq. (6)
No-resistance	1.38 J	3.37 J
Flow resistance 5	1.50 J	3.44 J
Tissue resistance	1.49 J	3.51 J
Tissue + Flow resistance 5	1.62 J	3.61 J
Tissue + Flow resistance 10	1.74 J	3.71 J
Tissue + Flow resistance 15	1.89 J	3.92 J

No difference between Tissue resistance model and Flow resistance 5 model without inspiratory hold compared to significant difference with inspiratory hold (Fig. S1).

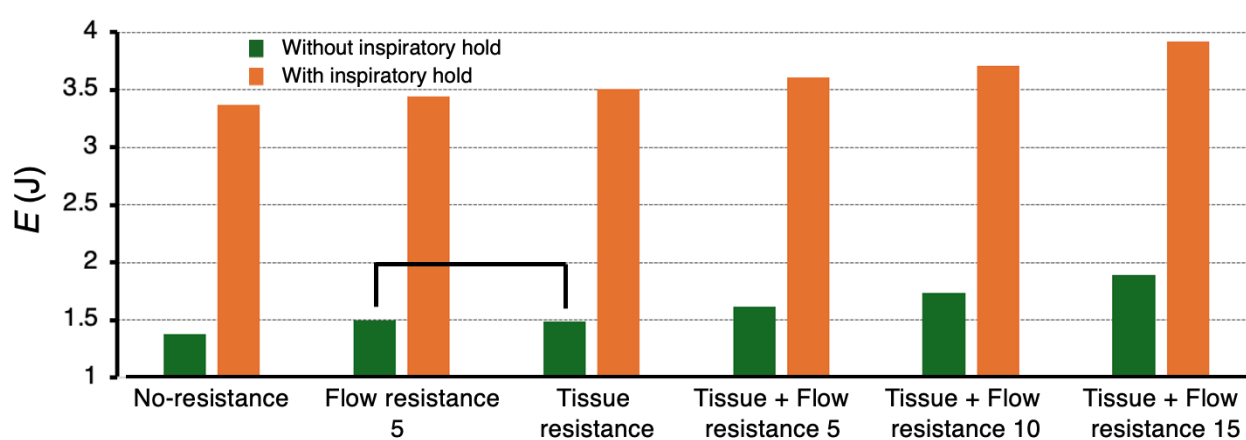


Figure S1. Calculated average mechanical energy delivered to the model of the respiratory system with/without inspiratory hold according to Chi et al. [11].