BREATHER FIT

WORK HARD. BREATHE EASY.

IMPACT OF RMT ON

PHYSIOLOGICAL & COGNITIVE FUNCTIONS AT ALTITUDE

Exercising at altitude is associated with altitude-induced hypoxia, causing increased minute ventilation due to reduction in arterial oxygen partial pressure. The accompanying reduction in arterial CO2 causes vasoconstriction and reduces blood supply to the brain, affecting cognitive function due to local hypoxia.

Respiratory muscle training (RMT) may improve oxygen saturation, perception of dyspnea, exercise capacity, and cognitive function at altitude.

EVIDENCE:

1. A 4 week RMT program effectively reduced inspiratory muscle fatigue in exercise in normoxia and hypoxia. In addition, RMT specifically improved oxygen uptake (by 8-12%), cardiac output (by 14%), ventilation (by 25%), and increased arterial oxygen saturation (by 4%), and lung diffusion capacity (by 22%) during training in hypoxia. RMT also reduced perceived effort and perceived dyspnea. **RMT therefore improves structural and functional physiologic measures in hypoxic exercise** [1].
2. Military personnel of the British Armed Forces underwent a 4 week RMT program prior to participating in an expedition to Mount Makalu in the Nepali Himalaya. Compared to a control group, RMT did not alter resting oxygen saturation (SpO2) up to altitudes of 4593 ft. However, resting SpO2 after RMT was 6% higher at altitudes of and above 16,011 ft; while perceived dyspnea was lower in the RMT group. **Therefore, RMT can protects from further decline in resting SpO2 at very high altitudes** [2].

3. RMT using an endurance training method improved cognitive function in a simulated altitude of 12,000 ft. Participants doing RMT performed up to 30% better at the Stroop test (capacity to direct attention), and showed 26% and 24% improvement at the correct responses and number of attempts sections of the Symbol Digit Modalities Test. Furthermore, RMT reduced reaction time by 16%. **Therefore, RMT may improve cognitive abilities and reaction speed at altitude, improving performance and decision-making** [3].

Based on the available evidence, RMT can be considered a suitable and effective method to improve pulmonary parameters and oxygenation at high altitude, contributing to increased performance and exercise capacity. In addition, RMT may enhance cognitive function and prevent altitude-mediated decline in attention and reaction time.

RMT protocols should be adjusted to subject specifics, considering cardiorespiratory fitness, age, and former exposure to altitude. Minimum training duration for effectiveness lies at 4 to 6 weeks, with at least 6 days of RMT per week and a minimum of 80% adherence.

ADDITIONAL BENEFITS OF RMT ON EXERCISE PERFORMANCE INCLUDE:

- Reduced exercise-induced dyspnea [4–6]
- Delayed time-to-fatigue (task failure) [4–6]
- Improved cardiorespiratory fitness [7–11]
- Improved heart rate variability [12]
- Reduced oxygen cost of breathing [13]
- Delayed respiratory metaboreflex [14]
- Improve blood flow to exercising limbs [14]
- Improved core strength, proprioceptive use and injury prevention [15]
- Average increase in performance by 11% [5].

HOW TO USE BREATHER FIT TO BOOST PERFORMANCE

- **Breather Fit** is intended for moderate to high intensity RMT in healthy adults and athletes. RMT is recommended at 50% to 70% of MIP for 2 to 3x 10 breaths, twice a day.
- In addition, using RMT to warm up respiratory muscles before high intensity exercise can significantly improve time to exhaustion. The protocol has to be determined individually for this purpose [14]

CONCLUSION

Integrating RMT using **Breather Fit** into your training schedule will boost your performance, fuel your body with oxygen and decrease the time to fatigue. At altitude, RMT may prevent or delay oxygen desaturation, thereby maintaining optimal physiological and cognitive functioning.

REFERENCES:

1. Downey AE, Chenoweth LM, Townsend DK, Ranum JD, Ferguson CS, Harms CA. Effects of inspiratory muscle training on exercise responses in normoxia and hypoxia. Respir Physiol Neurobiol. 2007;156: 137–146.
2. Lomax M. Inspiratory muscle training, altitude, and arterial oxygen desaturation: a preliminary investigation. Aviat Space Environ Med. 2010;81: 498–501.
3. Quackenbush J, Duquin A, Helfer S, Pendergast DR. Respiratory Muscle Training and Cognitive Function Exercising at Altitude. Aerosp Med Hum Perform. 2016;87: 18–25.
4. Shei RJ, Lindley M, Chatham K, Mickleborough TD. Effect of flow-resistive inspiratory loading on pulmonary and respiratory muscle function in sub-elite swimmers. J Sports Med Phys Fitness. 2016;56: 392–398.
5. Illi SK, Held U, Frank I, Spengler CM. Effect of respiratory muscle training on exercise performance in healthy individuals: a systematic review and meta-analysis. Sports Med. 2012;42: 707–724.
6. Ramsook AH, Molgat-Seon Y, Schaeffer MR, Wilkie SS, Camp PG, Reid WD, et al. Effects of inspiratory muscle training on respiratory muscle electromyography and dyspnea during exercise in healthy men. J Appl Physiol. 2017;122: 1267–1275.
7. Dall'Ago P, Chiappa GRS, Guths H, Stein R, Ribeiro JP. Inspiratory Muscle Training in Patients With Heart Failure and Inspiratory Muscle Weakness. J Am Coll Cardiol. 2006;47: 757–763.
8. Mancini DM, Henson D, La Manca J, Donchez L, Levine S. Benefit of selective respiratory muscle training on exercise capacity in patients with chronic congestive heart failure. Circulation. 1995;91: 320–329.
9. Mello PR, Guerra GM, Borile S, Rondon MU, Alves MJ, Negrão CE, et al. Inspiratory muscle training reduces sympathetic nervous activity and improves inspiratory muscle weakness and quality of life in patients with chronic heart failure: a clinical trial. J Cardiopulm Rehabil Prev. 2012;32: 255–261.
10. Laoutaris ID, Dritsas A, Kariofyllis P, Manginas A. Benefits of inspiratory muscle training in patients with pulmonary hypertension: A pilot study. Hellenic J Cardiol. 2016; doi:10.1016/j.hjc.2016.05.008
11. Laohachai K, Winlaw D, Selvadurai H, Gnanappa GK, d'Udekem Y, Celermajer D, et al. Inspiratory Muscle Training Is Associated With Improved Inspiratory Muscle Strength, Resting Cardiac Output, and the Ventilatory Efficiency of Exercise in Patients With a Fontan Circulation. J Am Heart Assoc. 2017;6. doi:10.1161/JAHA.117.005750
12. de Abreu RM, Rehder-Santos P, Minatel V, Dos Santos GL, Catai AM. Effects of inspiratory muscle training on cardiovascular autonomic control: A systematic review. Auton Neurosci. 2017;208: 29–35.
13. Turner LA, Tecklenburg-Lund SL, Chapman RF, Stager JM, Wilhite DP, Mickleborough TD. Inspiratory muscle training lowers the oxygen cost of voluntary hyperpnea. J Appl Physiol. 2012;112: 127–134.
14. Chiappa GR, Roseguini BT, Vieira PJC, Alves CN, Tavares A, Winkelmann ER, et al. Inspiratory muscle training improves blood flow to resting and exercising limbs in patients with chronic heart failure. J Am Coll Cardiol. 2008;51: 1663–1671.
15. Janssens L, McConnell AK, Pijnenburg M, Claeys K, Goossens N, Lysens R, et al. Inspiratory muscle training affects proprioceptive use and low back pain. Med Sci Sports Exerc. 2015;47: 12–19.
16. Thurston TS, Coburn JW, Brown LE, Bartolini A, Beaudette TL, Karg P, et al. Effects of Respiratory Muscle Warm-up on High-Intensity Exercise Performance. Sportscience. Multidisciplinary Digital Publishing Institute; 2015;3: 312–324.