



Breath, Body & Biochemistry

Patrick McKeown



Integrative
& Personalised
Medicine 26

18 - 20 June 2026 • London UK

TEST YOUR BREATHING

- Take a silent breath in and out through your nose.
- Pinch your nose with your fingers to hold your breath.
- Hold your breath for as long as you can and **still have normal breathing when you resume breathing.**





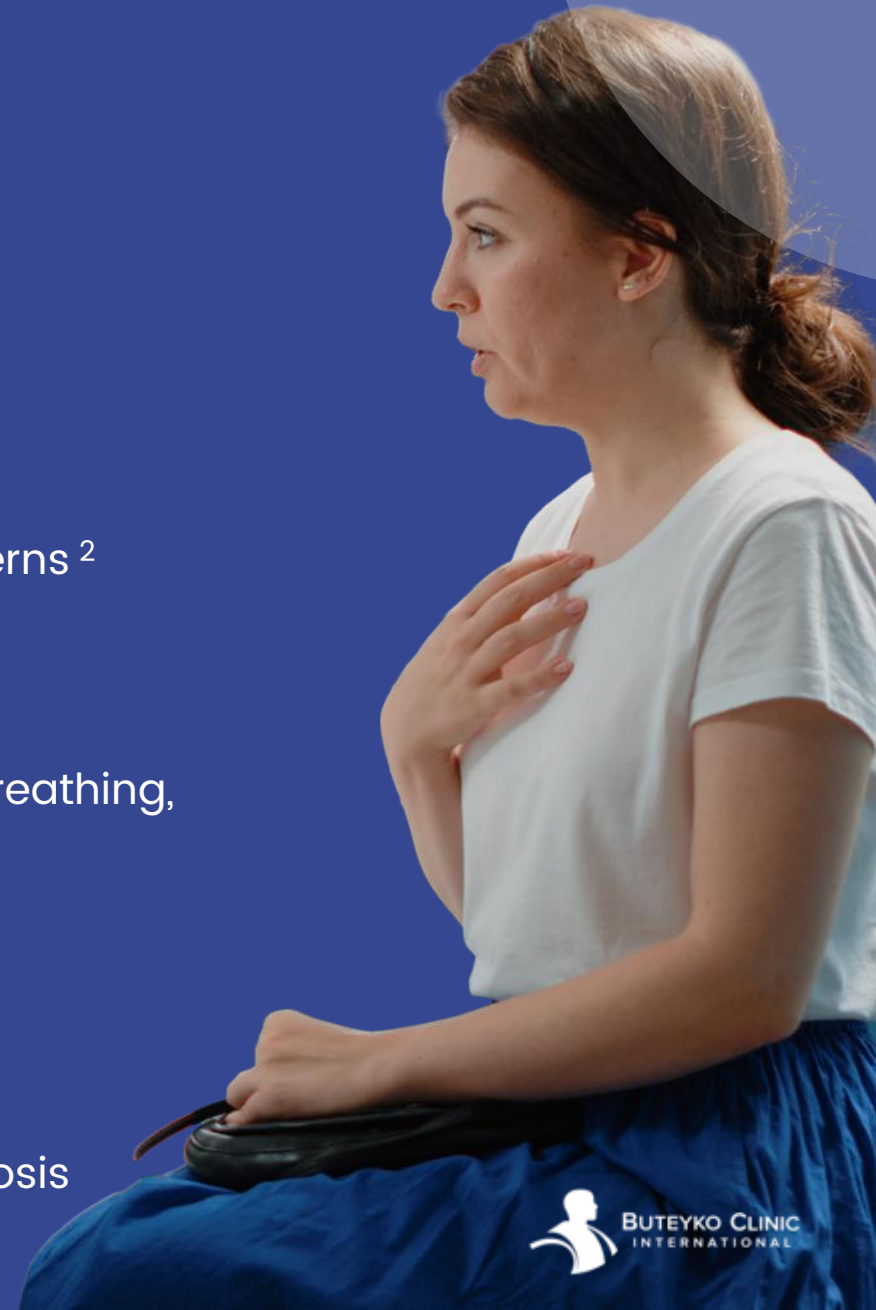
ADULT MEASUREMENTS	CP (sec)
Main symptoms are present: Cough, wheeze, exercise induced bronchoconstriction, nasal congestion, snoring, feeling of air hunger, frequent sighing, frequent yawning, cold hands and feet etc.	10 20
Main symptoms are significantly reduced. A trigger could bring on symptoms.	30 40

Dysfunctional Breathing

Prevalence

- ~10% in general population ¹
- 50–80% of adults may show some form of dysfunctional patterns ²
- 60–75% in anxiety, PTSD, phobias and related disorders ^{3, 4, 5}
- 29–63% Long COVID ⁸
- 71% ME/CFS patients showed hyperventilation, dysfunctional breathing, or both ⁹
- 47% in severe asthma ¹⁰

Often mistaken for psychological symptoms, confounding diagnosis





Dysfunctional	Functional
Mouth breathing	Nose breathing
Fast, shallow, irregular	Light, slow, regular
Chest/neck muscles	Diaphragmatic
↑ arousal, ↑ stress, anxiety, repetitive thoughts, poor sleep	Calm state, good sleep

Could breathing patterns be keeping your clients stuck?



Consequences of Dysfunctional Breathing

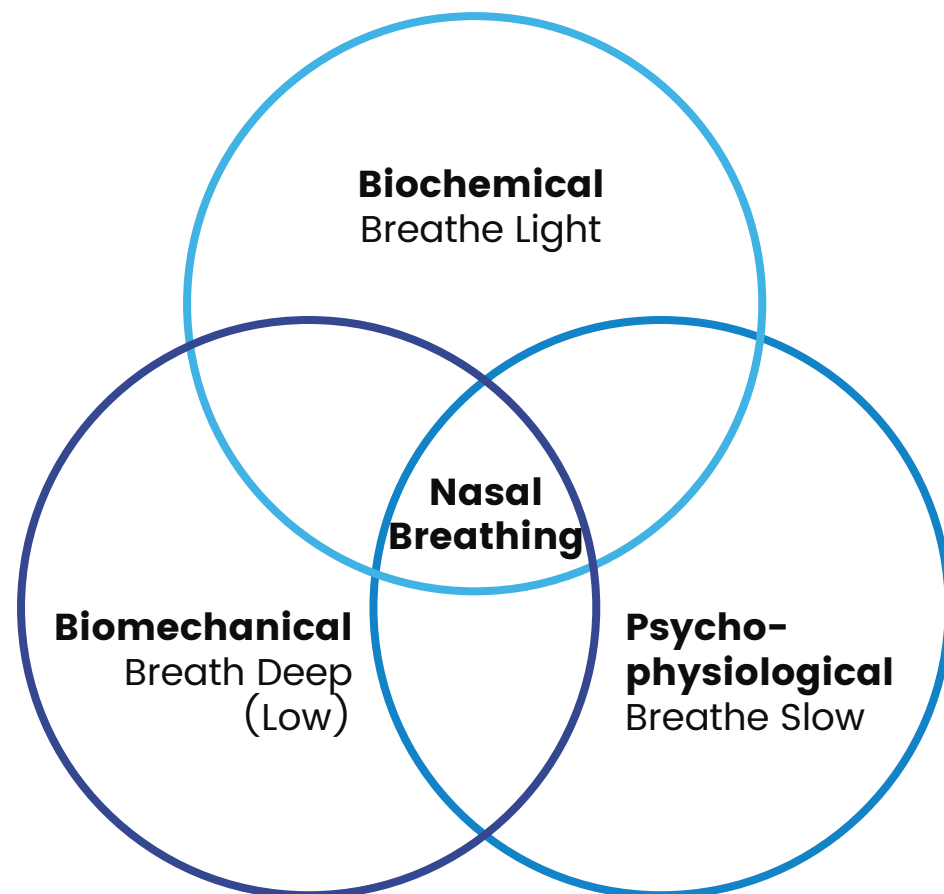
- reduced O₂ uptake
- poor CO₂ tolerance
- respiratory issues
- anxiety, panic
- sleep disruptions
- energy depletion
- impaired concentration



Consequences of Dysfunctional Breathing

- Reduces blood circulation
- Cerebral vasoconstriction → reduced blood flow and O₂ to brain ¹⁷
- Lower concentration, focus, anxiety
- Increased stress response/SNS arousal
- Hyperarousal and neuronal hyperexcitability ¹⁶

Breathe Light, Slow and Deep



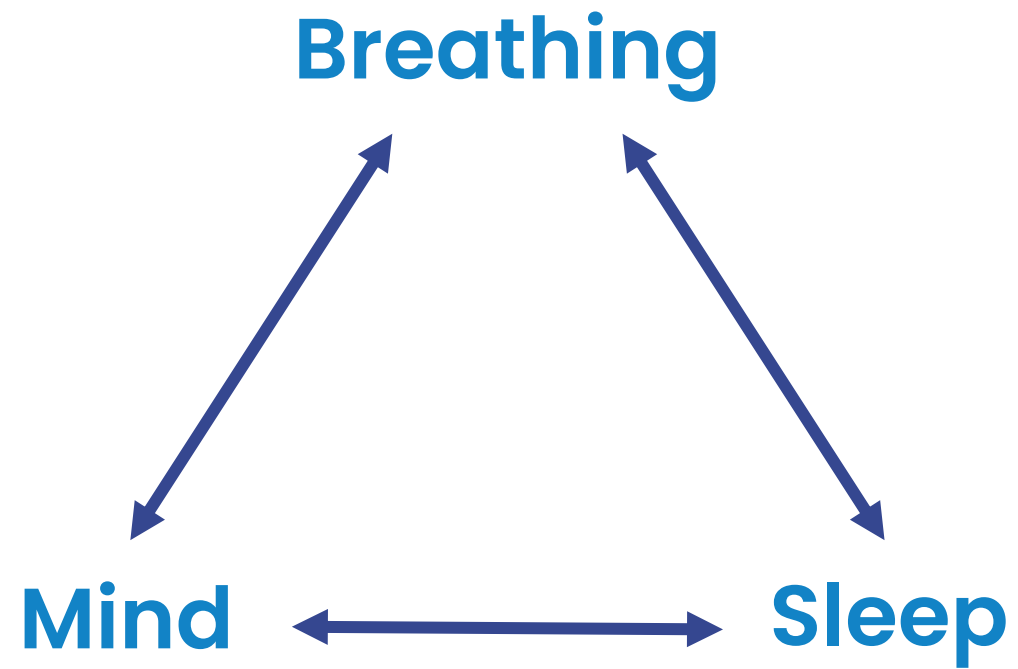
Impact of Breathing Less (increased CO₂)

- Increased cerebral blood flow (CBF) ¹²
- Enhanced cognitive performance ¹³
- Suppressed brain metabolism ¹⁴
- Altered neural activity including:
 - ↑ Low-frequency EEG → low-arousal state ¹⁴
 - ↓ DMN connectivity → suppresses rumination ¹⁴
 - ↓ cortical activity ¹⁵



Breathing Exercises and CBF

- Breathing exercises (slow nasal breathing or breath holds)
 - Can significantly increase arterial CO₂ and, consequently, CBF and oxygenation ¹⁸
- Nasal breathing
 - During moderate-intensity aerobic exercise promotes transient hypercapnic state, which increases CBF more than oronasal breathing
 - May stimulate neuroplasticity and cognitive improvements ¹⁹
- Therapeutic potential
 - Breathing retraining to normalize CO₂ can increase CBF, improve concentration, and lower neural activity ^{14, 18}



**SCAN
ME!**



References

1. Vidotto, L. S., Bigliassi, M., Jones, M. O., Harvey, A., & Carvalho, C. R. (2018). Stop thinking! I can't! Do attentional mechanisms underlie primary dysfunctional breathing? *Frontiers in physiology*, 9, 782.
2. Kiesel, K., Rhodes, T., Mueller, J., Waninger, A., & Butler, R. (2017). Development of a screening protocol to identify individuals with dysfunctional breathing. *International Journal of Sports Physical Therapy*, 12(5), 774.
3. Courtney, R. (2016). Multi-dimensional model of dysfunctional breathing and integrative breathing therapy—commentary on the functions of breathing and its dysfunctions and their relationship to breathing therapy. *J Yoga Phys Ther*, 6(4), 257.
4. Sohn, I., & Cho, I. (2023). dysfunctional breathing and anxiety related disorder. *European Psychiatry*, 66(S1), S685–S685.
5. Wilson, C. (2018). Hyperventilation syndrome: diagnosis and reassurance. *Journal of Paramedic Practice*, 10(9), 370–375.
6. McKeown, P. (2021). *The Breathing Cure: Exercises to Develop New Breathing Habits for a Healthier, Happier and Longer Life*: OxyAT Books.
7. Timmons, B. H., & Ley, R. (Eds.). (1994). *Behavioral and psychological approaches to breathing disorders*. Springer Science & Business Media.
8. Belli S, et al. (2022). An impairment in resting and exertional breathing pattern may occur in long-COVID patients with normal spirometry and unexplained dyspnoea
9. Mancini DM, Brunjes DL, Cook D, Soto T, Blate M, Quan P, Yamazaki T, Norweg A, Natelson BH. (2025). Abnormal breathing patterns and hyperventilation are common in patients with chronic fatigue syndrome during exercise. *Frontiers in Medicine*, 12, 1669036. Lin, L., Zhao, T., Qin, D., Hua, F., & He, H. (2022). The impact of mouth breathing on dentofacial development: A concise review. *Frontiers in public health*, 10, 929165.
10. Ruane, L. et al. (2024). "Dysfunctional breathing or breathing pattern disorder: New perspectives on a common but clandestine cause of breathlessness." *Respirology*, published August 2024. Yoon, S., Zuccarello, M., & Rapoport, R. M. (2012). pCO₂ and pH regulation of cerebral blood flow. *Frontiers in physiology*, 3, 365.
11. Tari, B., Vanhie, J. J., Belfry, G. R., Shoemaker, J. K., & Heath, M. (2020). Increased cerebral blood flow supports a single-bout postexercise benefit to executive function: evidence from hypercapnia. *Journal of Neurophysiology*, 124(3), 930–940.
12. Xu, F., Uh, J., Brier, M. R., Hart, J., Jr, Yezhuvath, U. S., Gu, H., Yang, Y., & Lu, H. (2011). The influence of carbon dioxide on brain activity and metabolism in conscious humans. *Journal of cerebral blood flow and metabolism : official journal of the International Society of Cerebral Blood Flow and Metabolism*, 31(1), 58–67.
13. Thesen, T., Leontiev, O., Song, T., Dehghani, N., Hagler, D. J., Jr, Huang, M., Buxton, R., & Halgren, E. (2012). Depression of cortical activity in humans by mild hypercapnia. *Human brain mapping*, 33(3), 715–726.
14. Sikter, A., & De Guevara, R. (2011). A Probable Etiology and Pathomechanism of Arousal and Anxiety on Cellular Level – Is It the Key for Recovering from Exaggerated Anxiety?. In (Ed.), *Anxiety Disorders*. IntechOpen.
15. Giardino, N. D., Friedman, S. D., & Dager, S. R. (2007). Anxiety, respiration, and cerebral blood flow: implications for functional brain imaging. *Comprehensive psychiatry*, 48(2), 103–112.
16. Gersten, A., Perle, J., Raz, A., & Fried, R. (2011). Simple exercises that significantly increase cerebral blood flow and cerebral Oxygenation. *arXiv preprint arXiv:1103.5494*.
17. Moris, J. M., Cardona, A., Hinckley, B., Mendez, A., Blades, A., Paidisetty, V. K., Chang, C. J., Curtis, R., Allen, K., & Koh, Y. (2023). A framework of transient hypercapnia to achieve an increased cerebral blood flow induced by nasal breathing during aerobic exercise. *Cerebral circulation – cognition and behavior*, 5, 100183.
18. Tavel, M. E. (2021). Hyperventilation syndrome: why is it regularly overlooked?. *The American Journal of Medicine*, 134(1), 13–15.