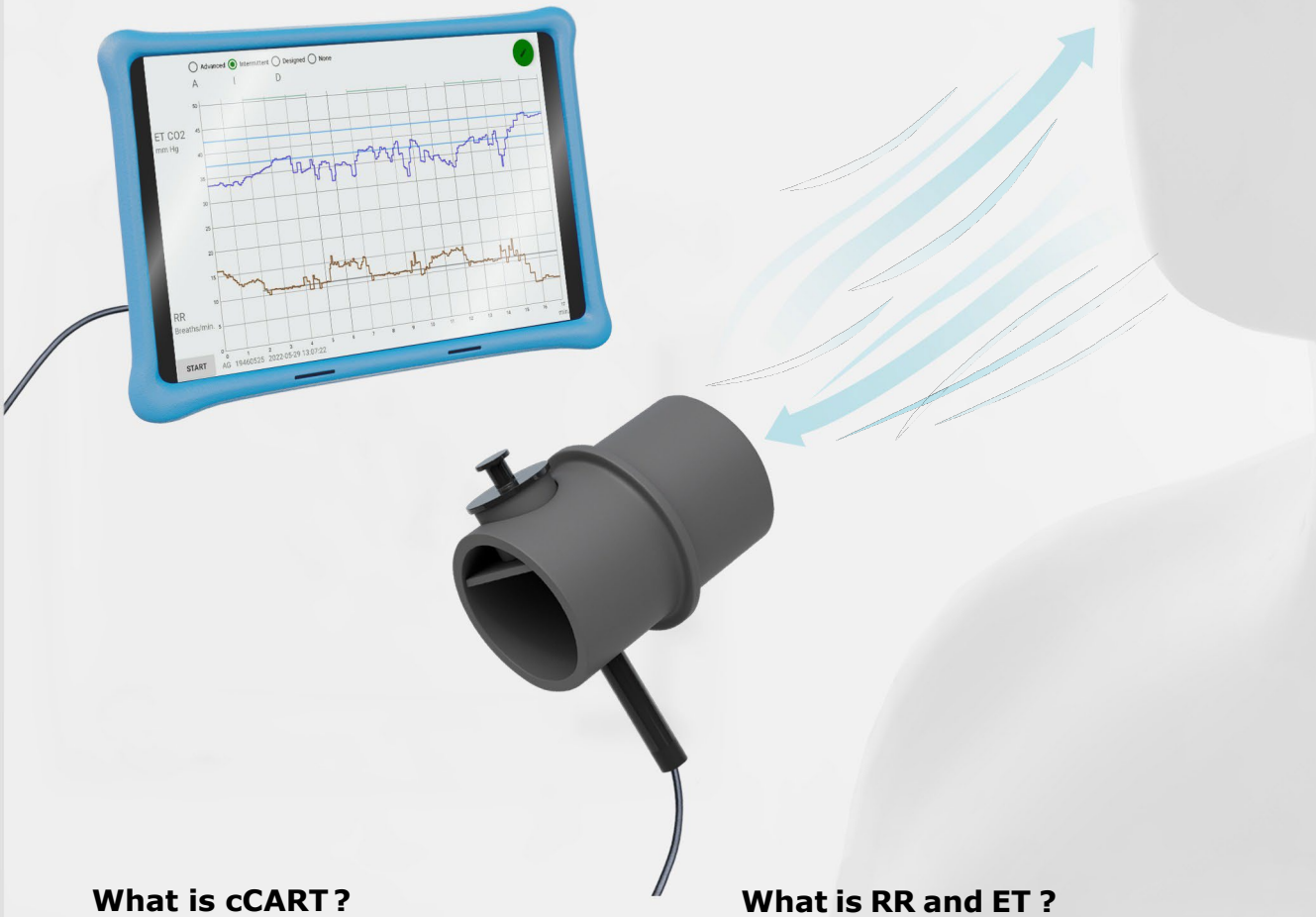
cCART

HELPS YOU BREATHE AT A HEALTHY LEVEL OF CARBON DIOXIDE



What is cCART ?

It is a **c**olorimetric **C**arbon dioxide **A**ssisted **R**espiratory **T**rainer for learning about breathing habits and how they affect the concentration of carbon dioxide (CO_2) in the exhaled air. cCART can train you to find and adopt a sound breathing pattern. *

How does it work ?

The carbon dioxide concentration in the exhaled air is continuously measured and from this the respiratory rate **(RR)** and the so called End-Tidal CO_2 concentration **(ET)** are calculated. RR and ET are displayed for each breath and can be compared to targeted values.

What is RR and ET ?

RR is the number of breaths you take in one minute and ET is the CO_2 concentration at the very end of an expiration. ET is related to the CO_2 concentration of arterial blood which plays an important role in the regulation of breathing.

Why use cCART ?

Because it can teach you to breath in different ways, as explained in the section “coached breathing” below. Finding a breathing pattern that produces normal levels of carbon dioxide will help you develop a sound way of breathing. With training it can turn into a healthy habit.

* The device is **NOT** intended for diagnosis and/or treatment of disease or medical purposes of any kind. It must **NOT** be used by persons with significantly altered CO_2 levels due to underlying conditions such as severe lung disease or morbid obesity.

A training session, if not interrupted, lasts for 15 minutes. Each session is preceded by a startup phase of 2 minutes. Training time can be spent either by breathing on your own or by breathing with a "coach".

Coached breathing means that you try to inhale and exhale in synchrony with a rising and falling sound signal. In this way you are coached to breathe at a targeted respiratory rate.

Modes of operation: You can chose from three alternatives, denoted A, I and D below. They provide a wide range of training options to suit your preferences.

A offers an ambitious, regulated training program comprising 56 sessions, each with 10 minutes of coached breathing followed by 5 minutes of breathing on your own. For each session there is a predetermined targeted RR value. This type of training with two sessions per day, takes 28 days to complete and has been suggested to be helpful for those suffering from anxiety disorders (panic attacks, PTSD) (1,2) and from asthma (3) and COPD (4).

I offers intermittent more personalized coaching, where a training session is made up of three consequtive sequences, each 3 minutes of coached breathing followed by 2 minutes of breathing on your own. The targeted RR values are determined by your actual RR and ET-value at the end of the startup phase.

D offers a free choice in designing the format for each training session. You can decide if/when to start/stop coached breathing and also set the targeted respiratory rate value of your desire (between 5.5 and 17).

Documentation: At the end of a session your data can be saved for later review.

Parts of cCART

- Measuring head with cable to Display unit
- Exchangeable sensor
- Display unit (Android compatible)
- Software APP: cCART

- Nasal and/or oral connectors, shown below

Specifications:

Absolute accuracy ET CO2 : +- 2 mm Hg or 5% of the reading, whichever is largest

Resolution CO2 : 1 mm Hg

Respiratory rate : 3-30 Breaths / min

Accuracy Respiratory rate: +- 1 Breath / min

Usage time: 1 week. Shelf life > 1 year (at 23C)

References

1) Meuret, A. E., Wilhelm, F. H., Ritz, T., & Roth, W. T. (2008). *Feedback of end-tidal pCO2 as a therapeutic approach for panic disorder*. Journal of psychiatric research, 42(7), 560–568.

2) Meuret A.E., Rosenfield D., Hofmann S.G., Suvak, M.K., Roth, W.T. (2009). *Changes in respiration mediate changes in fear of bodily sensations in panic disorder*. Journal of Psychiatric Research, 43: 634-41

3) Thomas Ritz, David Rosenfield, Ashton M Steele, Mark W Millard, Alicia E Meuret. *Controlling Asthma by Training of Capnometry-Assisted Hypoventilation (CATCH) vs Slow Breathing: A Randomized Controlled Trial*. Chest Volume 146, Issue 5, November 2014, Pages 1237-1247

4) Norweg A.M, Skamai A, Kwon S.C. et al. *Acceptability of capnography-assisted respiratory therapy: a new mind-body intervention for COPD*. E R J Open Res. (2021) 7: 00256-2021

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