

Breathing Training for Panic Attacks and Hyperventilation

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DSM5 Panic Attack Symptoms

An abrupt surge of intense fear or intense discomfort that reaches a peak within minutes and during which time four or more of the following symptoms occur.

Palpitations, pounding heart, or accelerated heart rate

Sweating

Trembling or shaking

Sensations of shortness of breath or smothering

Feeling of choking

Chest pain or discomfort

Nausea or abdominal distress

Feeling dizzy, unsteady, lightheaded, or faint

Chills or heat sensations

Paresthesias (numbness or tingling sensation)

Derealization (feelings of unreality) or depersonalization (being detached from oneself)

Fear of losing control or “going crazy”

Fear of dying

Most common symptoms of hyperventilation in large ED series

1. Fear 95%
2. Paresthesia 62%
3. Dizziness 50%
4. "Stress" 36%
5. Thoracic pain 29%

Patients in this series were all observed to have respiratory rate >20 and no other cause to explain.

Pfortmueller et al. 2015

Symptoms of hyperventilation, series 270 cases,

Lum 1975

CARDIOVASCULAR:

palpitations, tachycardia, precordial pain

Raynauds phenomenon

NEUROLOGICAL:

Central: dizziness, disturbance of consciousness/vision

Peripheral: paraesthesiae, tetany (rare)

RESPIRATORY:

shortness of breath, "asthma"

chest pain

GASTROINTESTINAL:

globus, dysphagia, epigastric pain

aerophagy

MUSCULOSKELETAL:

muscle pains, tremors, tetany

PSYCHIC:

tension, anxiety

GENERAL:

fatiguability, weakness, exhaustion, sleep disturbance nightmares

Hyperventilation Symptoms: Nijmegen Questionnaire

Chest pain

Feeling tense

Blurred vision

Dizzy spells

Feeling confused

Faster or deeper breathing

Short of breath

Tight feelings in chest

Bloated feeling in stomach

Tingling fingers

Unable to breathe deeply

Stiff fingers or arms

Tight feelings round mouth

Cold hands or feet

Palpitations

Feeling of anxiety



Breathing Their Way to an Altered State

As psychedelics move from the underground to mainstream medicine, clinicians aspiring to work in the field are inducing altered states with deep breathing.

New York Times January 9, 2024

Effects observed during HVB* aimed at therapeutic effects (*High Ventilation Breathwork)

“Acute effects include (but are not limited to) light-headedness, visual disturbances, watery eyes, paraesthesia, palpitations, shakiness, dry mouth, tinnitus, anxiety, hot flushes, sweating, fatigue, or exhaustion (Posse et al., 1997). Spontaneous movement may also occur, as well as cramping of the extremities, in particular the hands. Individuals often exhibit emotional behaviours in the form of crying and cathartic noises such as laughing, screaming, groaning, sighing, infant noises, animal-like grunts, chanting, or talking in tongues.”

Fincham GW, Kartar A, Uthaug MV, et al. High ventilation breathwork practices: An overview of their effects, mechanisms, and considerations for clinical applications. *Neurosci Biobehav Rev.* 2023;155:105453. doi:10.1016/j.neubiorev.2023.105453

Lum 1975: The article that started me off on this

“OVER THE PAST decade, some 700 cases of the hyperventilation syndrome have been studied in the respiratory physiology department of Papworth Hospital.”

“Time does not allow a discussion of the details of treatment, beyond saying that we try to make patients aware of their disordered breathing habits and convert to a slow diaphragmatic type of breathing. In the older patients this often requires much patient work by the physiotherapist. No patient under 25 has failed to be completely cured. Two thirds of all patients so treated are completely relieved of symptoms. It is very uncommon to find a patient who does not experience marked improvement.”

Lum LC. 1975. Hyperventilation: The tip and the iceberg. *Journal of Psychosomatic Research*, 19, 375-383.

More about physiology of hyperventilation

Increases pH (respiratory alkalosis) (7.39 to 7.75 in study by Steuer 1997)

Causes vasoconstriction in cerebral blood supply. (“Voluntary hyperventilation rapidly and strongly reduces CBF[cerebral blood flow], but (except for extreme cases) does not decrease cerebral oxygen consumption in healthy persons (Posse 1997)”

Causes hemoglobin to hold oxygen more tightly

“Alkalosis/hypocapnia impair GABAergic inhibition of excitatory neurons” (Fincham 2023)

Is thought to increase calcium adherence to protein, resulting in effective hypocalcemia, and this is said to be mechanism for paresthesia and cramps, although 2 studies (Stadler 1995, Steurer 1997) cast doubt on this. Has also been found to produce “significant changes” in “magnesium, potassium, chloride, phosphate and bicarbonate.” (Stadler 1995.)

Let's do some divergent thinking
about:

What other medical conditions can produce the
symptoms we've been talking about?

Partial Differential Diagnosis for the symptoms we've been talking about

Asthma

Pneumonia

Anaphylaxis

Pneumothorax

Dysrhythmias

Drug, direct or withdrawal

Hyperthyroidism

Hypoglycemia

Pheochromocytoma

Serotonin syndrome

Vestibular disorders

Pulmonary edema

Hypoparathyroidism

TIA's (transient ischemic attacks)

Focally originating seizures

Angina, MI (myocardial infarction)

Pulmonary embolus

POTS (postural orthostatic tachycardia syndrome)

Neuroleptic Malignant Syndrome

Prevalence of Panic Disorder in Children and Adolescents: Hard to Nail Down

Prevalence community samples ranges from 0.5% to 5% (DSM5: 2-3% in adults and adolescents)

Prevalence in C&A clinics from 0.2% to 10%

2% to 18% of adolescents at least one 4-symptom attack

“Up to 90%” have other anxiety disorders as well; “up to 50%” have other psychiatric comorbidity

Peak onset 15 to 19 (DSM5: median age 20-24)

10% to 18% first panic attack before age 10 (DSM5: panic disorder <0.4% under age 14)

DSM5: “Adolescents may be less willing than adults to openly discuss panic attacks.”

Relation of PD(panic disorder) to AG (agoraphobia)

“Lifetime prevalence estimates are 22.7% for isolated panic without agoraphobia (PA-only), 0.8% for PA with agoraphobia without PD (PA-AG), 3.7% for PD without AG (PD-only), and 1.1% for PD with AG (PD-AG).”

By this about 23% of those with PD have AG.

Kessler RC, Chiu WT, Jin R, Ruscio AM, Shear K, Walters EE. The epidemiology of panic attacks, panic disorder, and agoraphobia in the National Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2006 Apr;63(4):415-24. doi: 10.1001/archpsyc.63.4.415. PMID: 16585471; PMCID: PMC1958997.

Complications of Panic Disorder

“Subjects with panic disorder are nearly 4 times as likely to attempt suicide as compared to subjects without this condition.” (Tietbohl-Santos et al. 2019)

“In patients with panic disorder, suicidal ideation prevalence ranged between 17 and 32%, and 33% of them had a history of suicide attempts.” (De La Vega et al. 2018)

“Affected individuals experience significant impairment in social and vocational functioning, high utilization of medical resources, constriction of function, premature mortality and diminution in overall quality of life. Panic disorder is frequently comorbid with other conditions, particularly depression, as well as alcohol and other substance abuse, and other anxiety disorders...” (Pollack MH et al. 2000)

Pharmacological Treatment of Panic Disorder

APA Guidelines, 2010: “The use of a selective serotonin reuptake inhibitor (SSRI), serotonin-norepinephrine reuptake inhibitor (SNRI), tricyclic antidepressant (TCA), benzodiazepine (appropriate as monotherapy only in the absence of a co-occurring mood disorder), or cognitive-behavioral therapy (CBT) as the initial treatment for panic disorder is strongly supported by demonstrated efficacy in numerous randomized controlled trials [I].”

“There is insufficient evidence to recommend any of these pharmacological or psychosocial interventions as superior to the others, or to routinely recommend a combination of treatments over monotherapy.”

AACAP Guidelines Anxiety 2020

“AACAP suggests (2C) that combination treatment (CBT and an SSRI) could be offered preferentially over CBT alone or an SSRI alone to patients 6 to 18 years old with social anxiety, generalized anxiety, separation anxiety, or panic disorder.”

Among CBT techniques are listed “relaxation techniques including deep breathing.”

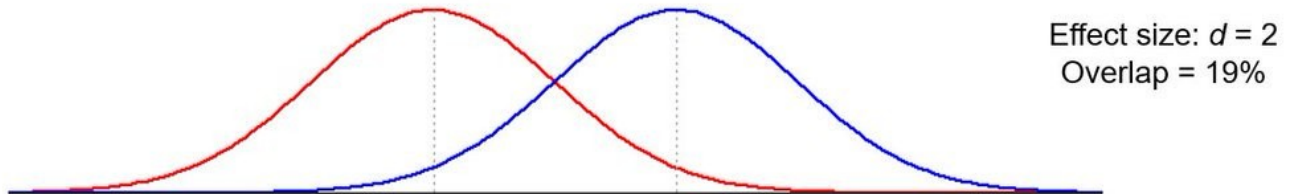
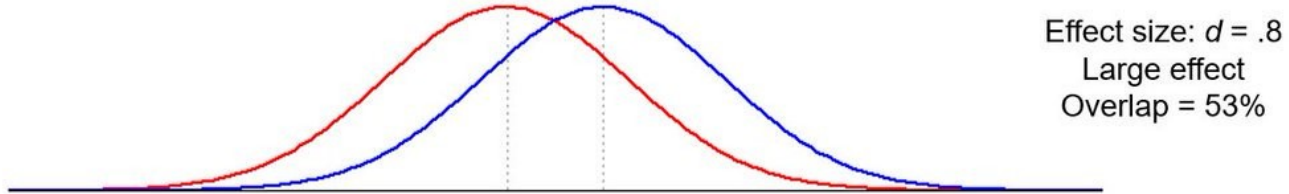
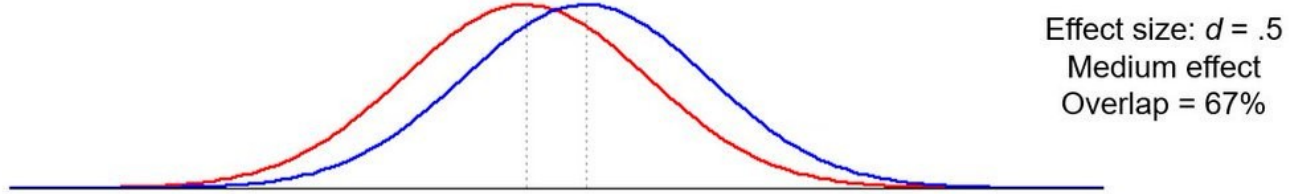
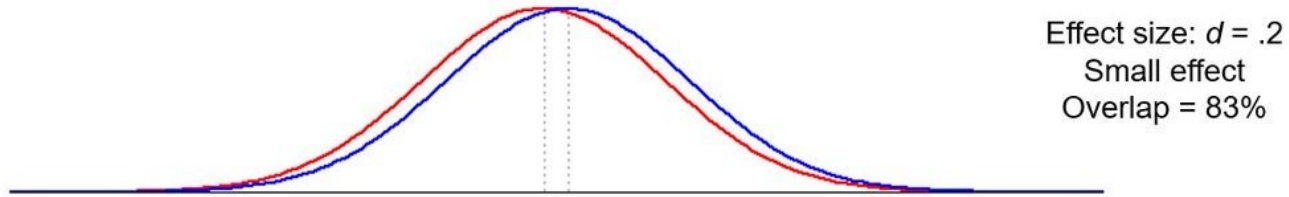
Walter HJ, Bukstein OG, Abright AR, et al. Clinical Practice Guideline for the Assessment and Treatment of Children and Adolescents With Anxiety Disorders. *J Am Acad Child Adolesc Psychiatry*. 2020;59(10):1107-1124. doi:10.1016/j.jaac.2020.05.005

Efficacy of SSRIs, Moderate Effect Size

“The mean effect size for acute treatment outcome for SSRIs relative to placebo was 0.55, not significantly different from that for antidepressants in general (0.55) and for imipramine in particular (0.48). More recent studies of SSRIs, and studies using larger samples, were associated with lower effect sizes.”

Otto MW, Tuby KS, Gould RA, McLean RY, Pollack MH. An effect-size analysis of the relative efficacy and tolerability of serotonin selective reuptake inhibitors for panic disorder. *Am J Psychiatry*. 2001;158(12):1989-1992. doi:10.1176/appi.ajp.158.12.1989

Understanding Effect Sizes



More on effect sizes

If you pick one person from each group randomly, what is the chance that the one from the higher group will actually have an outcome above the other person?

- For $d=.2$, it's 55.6%
- For $d=.5$, it's 63.8%
- For $d=.8$, it's 71.4%
- For $d=2$, it's 92.1%

Meta-analysis efficacy of Meds

Remission defined as no panic attack for 1 week (!?) after end of defined time on med.(without med discontinuation)

Risk ratio for paroxetine, sertraline, venlafaxine 1.42, 1.30, 1.26 respectively. (Chawla et al. 2022)

One study: panic free 35% placebo, 54% to 61% with SSRI. (RR 1.5 to 1.7) (Pollack MH et al. 2007)

Efficacy of paroxetine for panic

“Mean standardized difference was $d = 0.36$ (95% CI: 0.25, 0.46) for panic disorder....”

“Raw score differences were 3.24 points (95% CI: 2.32, 4.15) for panic disorder....” [On the Hamilton Rating Scale for Anxiety – 14 item scale, 0 to 4.]

Sugarman MA, Loree AM, Baltes BB, Grekin ER, Kirsch I. The efficacy of paroxetine and placebo in treating anxiety and depression: a meta-analysis of change on the Hamilton Rating Scales. PLoS One. 2014;9(8):e106337. Published 2014 Aug 27. doi:10.1371/journal.pone.0106337

SSRI vs Placebo Cochrane 2018

Placebo: Remission 44.3%

SSRI: Remission 54.9%

($44.3/54.9 =$ about 81% of remitters placebo remitters.)

Placebo: Response (much or very much improved): 45.5%

SSRI: Response 59.2%

Continuous measures: “The mean endpoint score for panic symptoms in the intervention groups was 0.28 standard deviations lower.”

Bighelli I, Castellazzi M, Cipriani A, Girlanda F, Guaiana G, Koesters M, Turrini G, Furukawa TA, Barbui C. Antidepressants versus placebo for panic disorder in adults. *Cochrane Database Syst Rev.* 2018 Apr 5;4(4):CD010676. doi: 10.1002/14651858.CD010676.pub2. PMID: 29620793; PMCID: PMC6494573.

What is exit strategy for SSRI?

APA Guideline: “Rapaport and associates (85) examined the long-term efficacy of sertraline in the treatment of panic disorder. Patients received 52 weeks of open-label sertraline treatment followed by a 28-week, double-blind, placebo-controlled discontinuation trial. Compared to those blindly tapered and switched to placebo, patients who continued to receive sertraline were less likely to have an exacerbation of panic symptoms (13% vs. 33%).”

Various studies of SSRIs have found continuation better than discontinuation.

Implication: Keep them on SSRIs for life?

[.67/.87=.77]

Rapaport MH, Wolkow R, Rubin A, Hackett E, Pollack M, Ota KY. Sertraline treatment of panic disorder: results of a long-term study. *Acta Psychiatr Scand.* 2001;104(4):289-298. doi:10.1034/j.1600-0447.2001.00263.x

Another follow-up after discontinuation – Nardi 2015

“Adult participants (n=105) entered the long term study during which they received three years of treatment with either clonazepam, paroxetine, or combination of both, followed by a slow tapering of drugs during two-four months. Participants were followed for a period of more than six years. This study found that almost all the patients relapsed during the six-year follow-up period with rates of 41 percent, 77 percent and 94 percent for years one, three and six, respectively.... Due to the high relapse rate even after three years, Nardi suggested stopping drugs earlier.”

Quoted from Magellan Clinical Practice Guideline, Panic Disorder, 2017

Questioning the strategy of drug continuation (this quote from an article on depression)

“The evidence supporting this strategy, [prolongation of drug treatment] however, is based mainly on clinical trials where remitted patients were randomized to drug continuation or placebo, without any differentiation between withdrawal and relapse. Such assumption has recently been challenged 65–68: we have no way to know how many of the relapses were actually withdrawal and post-withdrawal syndromes in the group that underwent drug tapering and discontinuation.”

Fava GA. May antidepressant drugs worsen the conditions they are supposed to treat? The clinical foundations of the oppositional model of tolerance. *Ther Adv Psychopharmacol.* 2020;10:2045125320970325. Published 2020 Nov 2. doi:10.1177/2045125320970325

Persistent SSRI Withdrawal Symptoms in Sample of 69 reports from Internet Forum survivingantidepressants.org

The prevalence rates of the various symptom domains persisting beyond the acute withdrawal phase (>6 weeks) are depicted graphically in Figure 4. General symptoms were reported by 30 people (43.5%). The most common symptoms from this group were headache (50.0% of all people with general symptoms) and fatigue (43.3%). Balance symptoms were reported by 12 people (17.4%), of which the most common specifically disclosed was dizziness (66.7%). Sensory symptoms were reported by 30 people (43.5%), of which 15 (50.0%) disclosed electric-shock-sensations (“brain zaps”). Visual symptoms were reported by 11 people (15.9%). These comprised visual changes in all cases (100%). Neuromotor symptoms were disclosed by 27 people (39.1%). The most common symptoms from this group were muscle aches (44.4%) and tremor (40.7%). Vasomotor symptoms were reported by five people (7.2%) and comprised mostly sweating (80.0%). Gastrointestinal symptoms were reported by 23 people (33.3%) and the most common symptoms specifically mentioned were nausea (47.8%) and diarrhea (43.5%). Affective symptoms were reported by 57 people (82.6%). The symptoms divulged most frequently in this group were anxiety (64.9%), depression (43.9%), and emerging suicidality (24.6%). Psychotic symptoms, specifically hallucinations, were reported by three people (4.3%). Sleep symptoms were reported by 30 people (43.5%) and in most cases (83.3%) comprised insomnia. Cognitive symptoms were stated by 22 people (31.9%) and comprised mostly decreased concentration (81.8%), which was frequently described as “brain fog”. Finally, persistent sexual symptoms were mentioned by two people (2.9%).

Hengartner MP, Schulthess L, Sorensen A, Framer A. Protracted withdrawal syndrome after stopping antidepressants: a descriptive quantitative analysis of consumer narratives from a large internet forum. *Ther Adv Psychopharmacol.* 2020;10:2045125320980573. Published 2020 Dec 24. doi:10.1177/2045125320980573

See also Framer A. What I have learnt from helping thousands of people taper off antidepressants and other psychotropic medications. *Ther Adv Psychopharmacol.* 2021;11:2045125321991274. Published 2021 Mar 16. doi:10.1177/2045125321991274

Problems Long Term Use of SSRIs

Tolerance, tachyphylaxis, increased difficulty withdrawing, which implies progressive change in endogenous serotonin system. Katz G.

Tachyphylaxis/tolerance to antidepressants in treatment of dysthymia: results of a retrospective naturalistic chart review study.

Psychiatry Clin Neurosci. 2011;65(5):499-504. doi:10.1111/j.1440-1819.2011.02231.x

Some evidence suggesting worsening of course of affective disorders.

Sexual side effects starting during therapy, sometimes reported to be permanent after withdrawal.

Weight gain after prolonged use.

Apathy syndrome.

Skill training interventions tend not to lead to such high rates of relapse after discontinuation

Study of CBT+ aerobic vs CBT+stretching for patients with panic disorder. Addition of aerobic seemed to improve outcomes.

“Researchers noted this study showed improvements in symptoms of anxiety due to combination CBT and aerobic exercise, not only holding stable, but also increasing over the long run.”

Quoted from Magellan Clinical Practice Guideline, Panic Disorder, 2017. Study is Gaudlitz K, Plag J, Dimeo F, Ströhle A. Aerobic exercise training facilitates the effectiveness of cognitive behavioral therapy in panic disorder. *Depress Anxiety* 2015; 32: 221-228

A Linguistic Problem with Psychosocial Interventions:

Research reports tend to treat psychosocial interventions as if they were as uniform as medications are – for example in trials of “SSRIs versus CBT” or “Efficacy of Breathing Retraining.” But CBT or Breathing Retraining can refer to very disparate interventions.

(Confession: I put the former phrase in the title of an article I wrote.) Strayhorn J Jr. Editorial: Cognitive-Behavioral Therapy Versus Serotonin Reuptake Inhibitors for Pediatric Obsessive-Compulsive Disorder. *J Am Acad Child Adolesc Psychiatry*. 2020;59(2):219-221. doi:10.1016/j.jaac.2019.03.015

Components of CBT[cognitive behavior therapy] for anxiety – not the topics for this hour

Identifying trigger situations

Ordering trigger situations on a hierarchy of difficulty

Rating SUD levels for trigger situations

Making up variations on trigger situations so as to have range of SUD levels

Learning categorization system for thoughts

Identifying automatic thoughts

Goal-setting for thought revision

Learning relaxation techniques

Practicing generating thoughts for situations

Using biofeedback with relaxation techniques

Relaxation practice built into routine

Construction of fantasy rehearsals of trigger situations (mastery and coping)

Doing fantasy rehearsals

Doing real-life rehearsal with trigger situations

Physical exercise

Celebrating all successes at every stage

What the Breathing Training intervention I'm about to describe is meant for

To eliminate the “full on” or “really bad” symptoms, thought to be products of hypocapnia...

Via an intervention that can be done in a short time...

In the patients where the episodes are mediated by hyperventilation, which I think is a large fraction of them, at least in adolescents...

Without getting rid of the disposition to anxiety and all the other problems that tend to move onto the to do list, which are responsive to intervention outside this hour's scope.

CO₂, Not Oxygen, is relevant for air hunger, hypervent symptoms, or panic

Hypoxia does not cause the desperate wish for more air, as evidenced by the effects of breathing carbon monoxide, helium, nitrogen.

When blood gas abnormalities are noted with panic attacks, they are hypocapnia and respiratory alkalosis, not hypoxia. Breathing is not too shallow – on the contrary, alveolar ventilation rate is too high.

This is widely misunderstood. For example, Mind Over Mood, million-selling CBT manual, depicts panic reaction as: increased heart rate → fear of heart attack → more shallow breathing → less oxygen to heart and brain → increased heart rate. (Greenberger D, Padesky CA, Mind Over Mood, 2nd edition, page 21)

Rebreathing into a bag

Used for decades, based on a correct notion that hypocapnia is the imbalance that needs to be remediated.

Problem: If the seal of bag with face is not permeable enough, the person will use up the O₂. If the seal is too permeable, the CO₂ will escape.

Some hypotheses:

A fundamental problem leading to the vicious cycle of hyperventilation is the mistaking of hypocapnia for hypercapnia.

This error is less dangerous to the organism than mistaking hypercapnia for hypocapnia! For that reason I'm guessing evolution favored what I called the "fundamental problem" over the other type of error.

The problem in a hyperventilation episode is too high a rate of alveolar ventilation (because of too high minute volume). Whether the ventilation is carried out by the diaphragm and abs or by the intercostals and other chest muscles is not important regarding hypocapnia. (May or may not be regarding parasympathetic activation.)

4 major ideas behind some clinicians' use of breathwork doubted:

1. That you need more oxygen
 2. That you need to breathe more deeply
 3. That you need to breathe with the diaphragm (and abs) rather than with the muscles that expand the chest
 4. That it makes a difference whether you use nose or mouth, use pursed lips, etc.
- What makes a difference is alveolar ventilation rate, a function of minute volume, which equals tidal volume x respiratory rate.

More hypotheses

As the word hyperventilation implies, hyperventilation episodes can be cured and prevented by learning to breathe more slowly at the right moments.

Training people to recognize the difference between hypercapnia and hypocapnia allows them to know when to breathe faster or slower – with the decision best made automatically rather than by reasoning.

Just instructing people how to breathe more slowly, without practicing to the point of automaticity, doesn't work because the panic tends to commandeer the logical reasoning system. (Limbic vs. Prefrontal?)

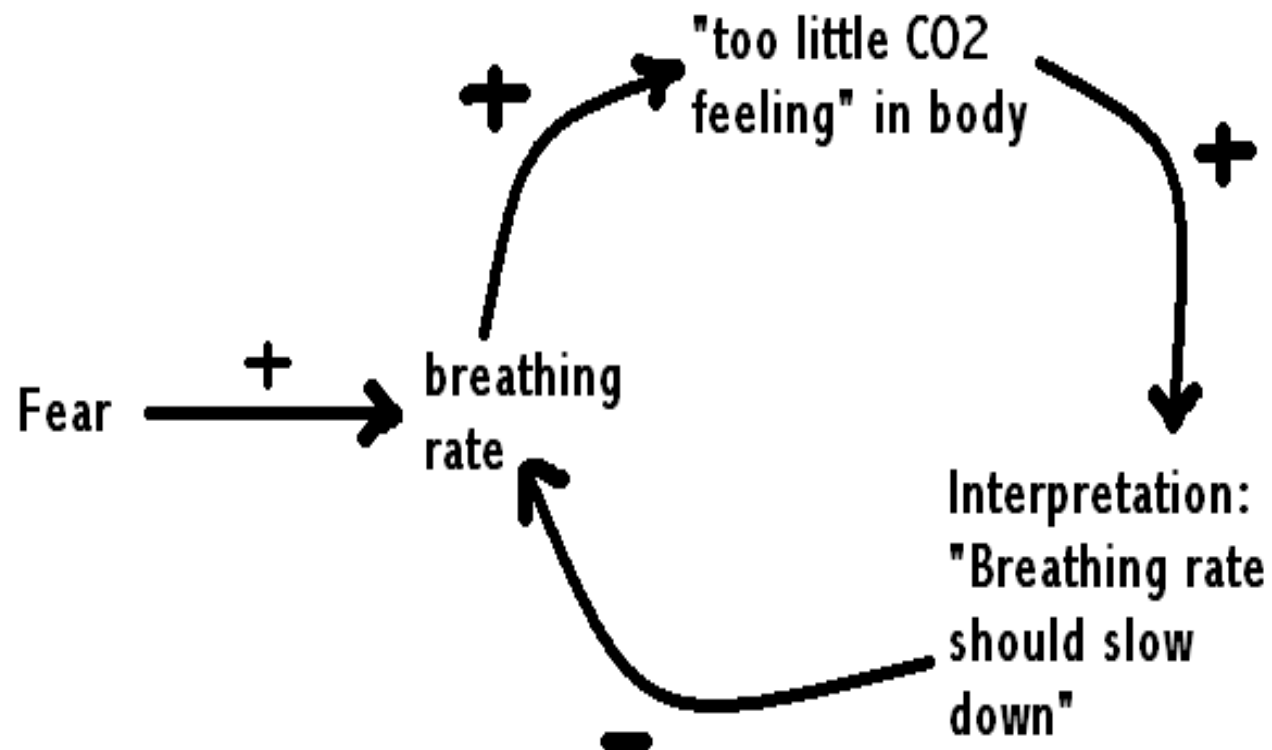
The Breathing Training in a Nutshell

It's important to teach the patient to understand the vicious cycle of hyperventilation.

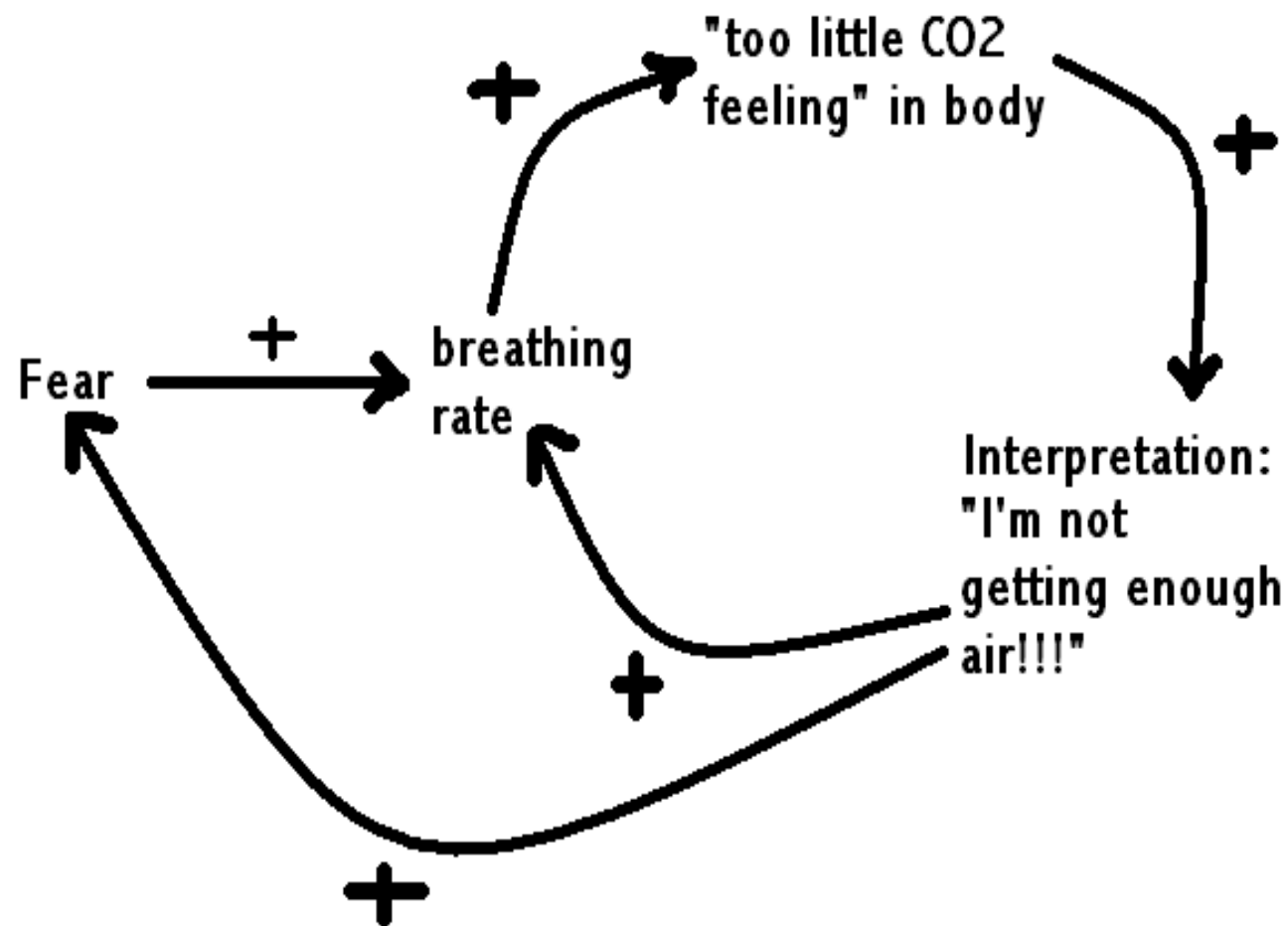
Three exercises should be taught and then practiced. 3 to 5 minutes a day is enough!

1. 5-in-and-5-out breathing
2. Hold your breath and then cure the high CO₂
3. Hyperventilate x ~10 or 15 breaths and cure the low CO₂

"Normal" Corrective Feedback Loop



Vicious Cycle: Panic Disorder - Hyperventilation



5 in and 5 out

Results in respiratory rate of 6/min. Hard to hyperventilate at that rate. Suggest looking at stopwatch on cell phone, start inhalation on 0, start exhalation on 5.

This is the “What to do if you feel an episode starting” PRN intervention. It also tends to feel pretty relaxing in itself. May stimulate parasympathetic system, but all it’s really claimed to do in this context is to be incompatible with a hyperventilation episode.

Note: This rate is appropriate at rest, not while you’re in the marching band, dancing, hurrying to catch a bus, etc.

RR(_{respiratory rate}) of 6 chosen to preclude hypocapnia rather than for parasympathetic activation but...

“The threshold for triggering this reflex (cardiovagal baroreflex sensitivity) can be lowered by a respiration rate around 0.1 Hz or about 6 breaths per minute. Interestingly, this is exactly the same respiration rate that is reported in respiration studies as having the highest increase of HRV [_{heart rate variability}].”

Gerritsen RJS, Band GPH. Breath of Life: The Respiratory Vagal Stimulation Model of Contemplative Activity. *Front Hum Neurosci*. 2018 Oct 9;12:397. doi: 10.3389/fnhum.2018.00397. PMID: 30356789; PMCID: PMC6189422.

See also: Russo MA, Santarelli DM, O'Rourke D. The physiological effects of slow breathing in the healthy human. *Breathe* 2017; 13: 298–309.

Exercise 2: Hold the breath and then cure the high CO₂

Hold the breath just long enough to where an unpleasant feeling of “air hunger” starts.

Try to record in memory what that “high CO₂” state feels like.

Take a couple of deep breaths as you naturally want to do after breath-holding, and get back to the original level of CO₂.

Exercise 3: Hyperventilate and then Cure the low CO₂ state

Plan ahead of time that after the hyperventilation, you're going to cure that by breathing very slowly – maybe one in and out over 40 seconds or so.

10 or 15 breaths as fast and deep as possible are usually enough for the person to feel a very slight lightheaded feeling. Start with 5 breaths for those who are afraid of precipitating an episode.

Evidence for effectiveness of interventions “like this”

Meuret et al. 2008:

The treatment had five major components:

- (a) educating patients about the role of breathing in the etiology and maintenance of PD,
- (b) directing their attention to potentially problematic respiratory patterns, particularly those observed during the extended physiological monitoring,
- (c) having them perform different breathing maneuvers with capnometer feedback to experience how changes in breathing affect physiology, symptoms, and mood,
- (d) teaching them ways to simultaneously control pCO₂ level and RR
- (e) and having them practice breathing exercises daily.

More on Meuret et al. 2008

“Effect size (Cohen, 1988) differences between BRT (breathing retraining therapy) and WL (wait list) at posttreatment were large ($d > 0.80$) for both psychological and respiratory measures, except for QS/pCO₂ ($d = 0.59$) and VH/pCO₂ ($d = 0.77$), which were at moderate levels.” (QS=Quiet sitting, VH=voluntary hyperventilation)

More on Meuret et al. 2008

“At posttreatment 40% had experienced no further panic attack during the four week period. At 2-month follow-up 62% had experienced no further panic attack since the end of treatment and 68% were panic-free at 12-month follow-up. Eighty-eight percent at 2-month follow-up and 96% at 12-month follow-up were either “much improved” or “very much improved” (CGI ≥ 3). [CGI=Clinical Global Improvement] A forty percent reduction in initial PDSS [panic disorder severity scale] scores (see Barlow et al., 2000) was achieved by 68% of the participants at posttreatment, 79% at 2-month follow-up, and 93% at 12-month follow-up.”

“Effect sizes (treatment group compared with wait-list group) were large for psychological measures (Cohen’s $d=0.97-2.21$) and moderate to large for respiratory measures ($d=0.59-1.23$).”

Effects not dependent on “respiratory subtype” or medication status.

Meuret on “deep breath”

“Panicking people are often told to calm down and ‘take a deep breath,’ Meuret said. But for someone hyperventilating during a panic attack, deep breathing is a bad idea. That's because hyperventilation happens when people breathe so quickly and deeply that they expel an unusually high amount of carbon dioxide, which in turn causes symptoms like dizziness and numbness. Those symptoms tend to make people feel like they're suffocating, so they breathe quicker and deeper, further exacerbating the problem.”

“It's not because they have a lack of oxygen, it's because they're exhaling too much air,’ Meuret said, adding, “Take a deep breath” is not a helpful instruction.”

2023 Review of Breathwork Interventions, mostly panic and agoraphobia

“The final review included sixteen studies that implemented a range of breathwork interventions for anxiety (Table 3). Overall, breathwork positively influenced patient outcomes; however, there was high variance in breathwork styles....All studies utilizing slow diaphragmatic breathing showed positive effects on stress reduction as well as significant improvement in outcome measures.” (Banushi et al. 2023)

Design of proposed study

Noting (but not requiring) variables during selection: resp. distress despite breathing as hard as one can, paresthesias

Inclusion of anyone with panic attacks who wants intervention but adolescents and young adults (up to 25) for case series. Exclude poorly controlled asthma, significant intellectual disability.

No randomization, all get intervention.

Every case is narrated as a case study.

Seeking 20 cases.

Panic attacks recorded, Panic Disorder Severity Scale (Shear) used as outcome measures

Recording of treatment adherence

More on design

Make 2 videos available to patients, one with explanation of vicious cycle of hyperventilation and rationale for the exercises, second with demonstration of the three exercises.

Make chapter on breathing available, clinicians can read with patients in “alternate reading” if desired.

Option of phone follow up by research staff in addition to that of clinician, monitoring adherence, checking on outcome variables, reminding what the exercises are, perhaps getting patient to do one or more of them on the spot.

Follow-up and monitoring of patients for 1 year.

Proposed Data Analysis

Insofar as possible, time series for each case. i.e. graph of number of panic attacks per week until intervention and after intervention.

Aggregate comparison of frequency of panic attacks during month before and after intervention, and beyond. Count number and % of patients with remission, very much or much improvement.

Comparison of Panic Disorder Severity Scale ratings before and after intervention.

There is not unanimity

APA guidelines, 2 sentences on breathing, one of which is: “Although the evidence suggests that breathing retraining is likely *not* a necessary component of treatment (175), it is still often included in CBT for panic disorder and may be a useful anxiety-reduction tool for some patients.”

Study cited in APA Guidelines

“In the present study, there was no apparent benefit for those in the CBT + BR group despite increased contact time.” (Schmidt 2000)

Description of breathing retraining technique:

“Instruction in BR exercises (diaphragmatic breathing) plus related practice homework.”

I [JS] wonder: do some BR interventions not work because the emphasis is on diaphragmatic breathing rather than on recognizing, correcting, and avoiding hypocapnia?

Cochrane Review

“There is no credible evidence regarding the effectiveness of breathing exercises for the clinical symptoms of DB/HVS. [dysfunctional breathing/hyperventilation syndrome] It is currently unknown whether these interventions offer any added value in this patient group or whether specific types of breathing exercise demonstrate superiority over others. Given that breathing exercises are frequently used to treat DB/HVS, there is an urgent need for further well designed clinical trials in this area.” (Jones et al., Cochrane Database of Systematic Reviews 2013)

Prevailing theory: Desensitization to Interoceptive Cues

This holds that the task is exposure to dizziness, heart pounding, etc. so as to desensitize a fear that the person has of their own physiological responses.

Another theory:

Problem is high sensitivity to increased pCO₂, and hyperventilation is a compensatory maneuver rather than a cause.

Study that seemingly contradicts but doesn't IMO [in my opinion]

Training to lower pCO₂ worked as well as training to raise.
(Kim et al. 2012, Opposing breathing therapies for panic disorder.) Both worked well in reducing panic attacks!

Has been found with several other biofeedback studies.

Raising and lowering both entail learning control.

For example, training in muscle relaxation often includes practice in tensing muscles.

Panic-hypervent connection stronger in younger?

3 small-sample studies cited in Kim 2012 article finding that in many patients, $p\text{CO}_2$ was not lowered during panic attacks.

Mention of hypothesis, hyperventilation more connected with panic attacks at the beginning, less so over time.

Possibility that body learns to recreate hyperventilation symptoms in absence of abnormal blood gases?

Possibility that adolescence represents opportunity to nip panic disorder in the bud before something happens to make it less amenable to breathing retraining?

All Good Things Must End

Thanks for your attention to this!