

The versatile effects of breath-holding

Frank M. Dattilio

Department of Psychiatry
Harvard Medical School

Summary

Breath-holding has been discussed in the professional literature as a technique for provoking symptoms in various anxiety disorders, but its sometimes paradoxical effects may also be used as a mode of treatment to reduce anxiety.

The process of inducing endogenous CO₂ accumulation by holding one's breath for varying amounts of time has helped to reduce anxiety in cases involving obsessive-compulsive disorder, shy bladder syndrome, and, in some circumstances, anxiety-induced nausea.

The following article addresses the effects of breath-holding and the disorders with which the technique may prove to be effective. Two case vignettes are used to illustrate the use of breath-holding. The article also considers the issue of whether or not breath-holding has been underutilized as an affective technique for a number of psychiatric disorders. Future directions for research in this area are also discussed.

Key Words: Breath-holding, CO₂, anxiety, paradoxical effects, respiration

Brief report

The Versatile Effects of Breath-holding

When children want something, or, more often, don't want to do something, they may swear they're going to hold their breath until they turn blue. This familiar threat may have its basis more in science than in drama. The potential discoloration of skin tone, often alarming to the watching parents, is due to an increase in carbon dioxide (CO₂) levels and a decrease in pure oxygen (O₂). However, breath-holding also has another, far less disturbing use. Breath-holding as a therapeutic technique was, in fact, discovered years ago by scientific practitioners in search of methods to reduce levels of distress caused primarily by anxiety.

A review of the professional literature indicates that the technique of breath-holding was first contemplated during the early part of the 20th century [1, 2, 3] by investiga-

Author's note: The author wishes to thank Mr. Eric Frey for his assistance with the literature search. Portions of this article were taken from a lecture series presented by the author at Ain Shams University of Cairo, Egypt.

tors exploring the effect that emotions had on respiration. It wasn't until decades later that further exploration centred on the actual benefits derived from breath-holding as a method for assessing and treating anxiety disorders, although others did investigate the use of CO₂ therapy for what was then termed as neurosis [4, 5].

Breath-holding is defined as the deliberate absence of breathing, indicated by a cessation of chest and other body movements, and the important physiological affects that occur as a result. Breath-holding may be carried out in two ways: (1) through the inhalation of breath and pursing of the lips for a specified amount of time, or (2) by the full exhalation of breath and pursing of the lips for a specified amount of time without breathing.

The act of breath-holding induces a CO₂ challenge to the body in that it increases autonomic arousal, depending on the length of time that the breath is held. Contingent on the psychophysiological condition of the individual, breath-holding may evoke various degrees of anxiety and, in some cases, alarm or an exaggerated reactivity. This is particularly true for individuals suffering from anxiety disorders, specifically panic. This is most likely due to the fact that, in general, there exists a significant relationship between CO₂ levels in the blood and lungs and a subjective sense of suffocation (1). During the process of breath-holding, the inspiration of breath increases O₂, which eventually becomes introduced by the body's alveoli capillary membranes into the bloodstream. As the breath is held, the level of CO₂ increases because it is not released as O₂ decreases. Conversely, the effect of retaining excess CO₂ produces a narcotizing effect, which may cause some sedation. In essence, this may, to some extent, produce a similar effect in the central nervous system (CNS). Consequently, holding one's breath for a period of 30 seconds can eventually cause the CO₂ level to increase by 5 ml. CO₂ can be readily measured either by means of blood gasses or by a transcutaneous monitor. An end tidal CO₂ monitor can also measure the level of CO₂ in the system.

The question that remains is what differentiates those who benefit from the breath-holding techniques from those who do not. This issue has not been fully explained in professional literature. The largest body of literature pertains to the anxiety sensitivity of panic-disordered patients, indicating that they are highly reactive to the inhaled CO₂ [6, 7]. Several studies have demonstrated that a CO₂-induced state produces intense bodily sensations that are similar to real-life panic attacks [6, 8]. In this respect, a CO₂ challenge increases autonomic arousal, which some anxiety-disordered individuals are likely to misinterpret as dangerous due to their high anxiety sensitivity, thereby precipitating anxiety attacks [9, 10]. Several investigators have found that individuals with anxiety disorders in general (i.e., generalized anxiety disorder, panic disorder, social phobia) tend to have elevated anxiety sensitivity, as compared to other clinical populations and normal controls [11]. This has been directly linked to fear of suffocation, which was first described by Klein [12] and then elaborated on by others [1, 13]. In some cases, however, just the opposite effects have been reported. Wolpe [14] first described the use of CO₂ to induce relaxation. Wolpe based his work, in part, on Meduna [4], who was a major proponent of the use of CO₂ therapy for what was then termed as neurotic anxiety. Wolpe suggested a mixture similar to that which LaVerne

[5] had proposed, which included 65% CO₂ and 35% O₂. It was also suggested that a cylinder of 40% CO₂ and 60% O₂ should be available to patients for whom the higher concentration was found to be irritating, and that a cylinder of 100% CO₂ be available for refractory cases [15, p. 183]. The mechanisms of the anxiety-reducing effects of CO₂ mixture are not known, but Wolpe [14] believed that they might result from the reciprocal inhibition of anxiety by the immediate responses to the gas, by the post-inhalation reactive relaxation, or both.

However, the specific concern here is whether or not the same relaxation effects can be obtained by having an individual regulate CO₂ levels by holding his or her breath for various amounts of time.

Some preliminary observations were made through case studies in which anxiety was reduced and performance was improved. These uncontrolled results, while not empirically based, may encourage further investigation, through controlled outcome studies, into breath-holding.

Vignette 1

The Case of Paruresis

Bill was a 41-year-old nurse, who was referred by his family physician for the treatment of paruresis, otherwise known as shy bladder syndrome. Bill had sought consultation with his physician because he was cited at work for not cooperating with on-site drug testing. Bill, who worked at a local hospital, was unable to produce urine samples upon demand. As a result, Bill was informed that if he did not comply, he would lose his job as the testing compliance was mandatory.

Bill's physician prescribed a compound known as Bumetanide, 0.5 mg, p.r.n., which is a loop-blocking diuretic known to induce urination. Several trials of the medication failed to induce Bill to void, and he was sent to a clinical psychologist for treatment of anxiety.

Bill described his problem as simply not being able to void in the presence of others, including public restrooms. He was also not able to void if he was aware that someone was in the vicinity or was expecting him to produce a urine specimen. Bill reported that this was a lifelong problem, but that it had become worse as he grew older.

Bill had initially asked if he could be hypnotized or taught some type of relaxation so that he could urinate freely. After being examined by an urologist and cleared for any medical aetiology, Bill felt confident that his inability to void was due to anxiety and that it was something that he could overcome.

It was explained that there might be a different approach to help him relax. The concept of breath-holding was described in detail. He consented to trying this technique since he felt that his job was in jeopardy.

The plan of having Bill attempt to urinate in a large public restroom at a time of day when it was unlikely to be crowded was discussed. This was done in order to decrease his sense of being observed or noticed by others in the vicinity. The anticipation of someone entering the restroom while he was present, even though it was

empty at the time, was enough to cause him to have anxiety and subsequent difficulty with voiding.

Bill was asked to attempt to urinate only when his bladder was full, in order to increase the likelihood of success. He was also told to wait until he experienced the afferent cue of needing to release his bladder before walking into a public restroom. As he walked through the door, he was instructed to hold his breath for 30 seconds and then to make an attempt to urinate. He began to hold his breath just prior to entering the men's room so that he would not have to stand too long at the urinal, not knowing in advance how long it would actually take him to void. The method of holding his breath seemed to give him confidence and he seemed to be very motivated. The first trial produced some urge and he came close, but was unable void. He was asked to repeat the same sequence of events. On the third try, he successfully urinated, emptying his bladder.

During this exercise, Bill was also instructed to specifically focus on the idea of holding his breath. In a sense, this had a paradoxical effect, encouraging him to focus on his physiological behaviours as opposed to the fact that he was not urinating and thereby allowing his anxiety about performance to decrease. Bill was then asked to repeat this on a regular basis until he could eventually practice urinating in public restrooms without holding his breath at all. He was then exposed to a hierarchical level of experience, urinating with were other individuals in the restroom and then with someone directly in his presence. Bill eventually worked his way up to being able to produce a full urine specimen for drug screening.

Vignette 2

The Case of Intrusive Visual Images

A case was presented in which a clinician described the use of breath-holding as a measure of rapid desensitization in a 31-year-old, Caucasian female, who presented with intrusive visual images that caused her anxiety [16]. The therapist explained that the woman described herself as having anxiety and difficulty sleeping after her next door neighbour had apparently murdered his wife and then blew the house up, killing himself and destroying the property. The patient's presenting complaint involved the intrusive visual image of her now-deceased neighbour coming after her with an axe, the weapon he had used in the murder of his wife. While the patient knew intellectually that this was impossible since he was dead, she found that the recurring images were quite strong and distressing. Her sleep was affected and she reported intense anxiety during waking hours. In an effort to bring immediate relief to her, the therapist developed a rapid desensitization procedure, which included the following steps.

The patient was briefly trained in subjective distress units (SUDS; 0-10) and a description of the distressing image was elicited. The therapist then asked her to close her eyes and represented a description of her feared image. She was instructed to signal the therapist by wiggling her finger when she was able to visualize the scene vividly. A SUDS rating was then obtained. She was then instructed to continue to visualize

the picture in her mind as she took and held a deep breath. She was asked to hold her breath while she counted to 20. At the count of 20, she was then instructed to let her breath out slowly and continuously and to relax. After about 15 more seconds had passed, the second SUDS rating was obtained. The procedure was repeated 31 times in the first session with the SUDS rating decreasing from 9 to 3 by the end of the session. Presented scenes were embellished as the exposure to treatment proceeded. The patient was initially seen on a Friday and was sent home with instructions to hold her breath for 20 seconds whenever the image popped back into her mind.

The patient was seen again the following Tuesday and 23 repetitions of the procedure were performed with her ultimate SUDS rating dropping to a level of 2. She was scheduled for a third session one week later, but called and cancelled, reporting significant symptomatic relief. A six-month follow-up phone call confirmed her satisfaction with the treatment and that she experienced no additional difficulties.

Discussion

The above vignettes provide examples of the ways in which breath-holding may be used preliminarily to reduce anxiety. In essence, breath-holding served as a cognitive distraction for the patients in both cases, meaning that they shifted their focus away from the target symptoms or behaviours. It may have also had a physiological effect that is unaccounted for in reducing anxiety as well. In the case of the paruresis (shy bladder syndrome), the individual was required to produce a urine sample but had been inhibited by anxiety, which was eventually reduced by breath-holding. Whether or not holding one's breath serves directly as the anxiety-reducing agent, or it provides cognitive avoidance is not clear. The mechanism for allowing the symptoms of anxiety to reduce is something that needs further investigation. Palmer [16] found breath-holding to be particularly useful with individuals who suffered anxiety disorders and were upper- chest breathers. Apparently the process of holding one's breath for varying amounts of time may have different effects with different people, depending on their methods of respiration. Perhaps the variables include individual tolerance level, individual idiosyncracies and anxiety sensitivity.

Goal direction may also play an important role in the effectiveness of breath-holding. Another factor might be the individual's belief that holding his or her breath could be helpful.

Certainly, this topic warrants additional study. A clinically controlled trial with a large sample would be key in being able to further evaluate the use of breath-holding as a potential treatment in reducing anxiety.

References

1. Rassovsky Y, Kushner MG, Schwarzer NJ, Wangenstein OD. *Psychological and physiological predictors of response to carbon dioxide challenges in individuals with panic disorder*. Journal of Abnormal Psychology, 2000, 109(4): 616–623.
2. Feleky A. *The influence of the emotions on respiration*. Psychological Review, 1914, 1: 218–241.

3. Skaggs EB. *Changes in pulse, breathing and steadiness under conditions of startledness and excited expectancy*. *Journal of Comprehensive Psychology*, 1926, 6: 303–318.
4. Meduna LJ. *Carbon dioxide therapy*. Springfield, IL: C. Charles Thomas Publishing; 1947.
5. LaVerne AA. *Rapid coma techniques of carbon dioxide inhalation therapy*. *Disorders of the Nervous System*, 1953, 14: 141.
6. Gorman JM, Askanazi J, Liebowitz MR, Fyer AJ, Stein J, Kinney JM, Klein DF. *Response to hyperventilation in a group of patients with panic disorder*. *American Journal of Psychiatry*, 1984, 141: 857–861.
7. Rapee RM, Brown TA, Antony MM, Barlow DH. *Response to hyperventilation and inhalation of 5.5% carbon dioxide enriched air across the DSM-III-R anxiety disorders*. *Journal of Abnormal Psychology*, 1992, 101: 538–552.
8. Fyer MR, Uy J, Martinez J, Goetz R, Klein DF, Fyer AJ, Liebowitz MR, Gorman JM. *CO₂ challenge of patients with panic disorder*. *American Journal of Psychiatry*, 1987, 144: 1080–1082.
9. Salkovskis PM, Clark DM. *Affective responses to hyperventilation: A test of the cognitive model of panic*. *Behaviour Research and Therapy*, 1990, 28: 51–61.
10. Dattilio FM. *Symptom induction and de-escalation in the treatment of panic disorder*. *Journal of Mental Health Counseling*, 1990, 12(2): 117–129.
11. Taylor S, Koch WJ, McNally RJ. *How does the anxiety sensitivity vary across the anxiety disorders?* *Journal of Anxiety Disorders*, 1992, 6: 249–259.
12. Klein DF. *False suffocation alarms, spontaneous panics and related emotions: An integrative hypothesis*. *Archives in General Psychiatry*, 1992, 50: 306–317.
13. Willem, Van der Does AJ. *Voluntary breath-holding: Not a suitable probe of the suffocation while in panic disorder*. *Behavior Research and Therapy*, 1997, 35(8): 779–784.
14. Wolpe J. *Psychotherapy by reciprocal inhibition*. Stanford: Stanford University Press; 1958.
15. Wolpe J. *The practice of behavior therapy (2nd ed.)*. New York: Pergamon Press, Inc; 1973.
16. Palmer M H. *A description of rapid desensitization procedure*. *The Behavior. Therapist*, 2002, 25(9): 171.

Author's address:

Dr. Frank M. Dattilio,
Department of Psychiatry,
Harvard Medical School
USA

E-mail address: datt02cip@cs.com