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Holotropic Breathwork: The Potential Role of a Prolonged, Voluntary Hyperventilation Procedure as an Adjunct to Psychotherapy

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ABSTRACT

Objectives: To pose the question of whether Holotropic Breathwork (HB), a prolonged, voluntary hyperventilation procedure, might be useful in treatment of common psychiatric conditions such as anxiety and depressive disorders.

Design: This is a hypothesis-posing paper pertaining to a potential novel treatment.

Summary: The neurophysiology and psychology of hyperventilation are reviewed, including findings demonstrating that hyperventilation leads to significant changes in central nervous system activity as measured by various technological means. Preliminary evidence suggesting efficacy for HB is reviewed. A tentative biopsychologic hypothesis is offered, suggesting a potential mechanism that may underlie putative therapeutic effects of HB. Specifically, when HB is used in the context of ongoing psychotherapy, hyperventilation may facilitate generalized extinction of avoidance behaviors, resulting in therapeutic progress. Individuals high in trait absorption and social desirability who have failed to respond adequately to psychotherapy might be those most likely to respond to HB. Recommendations for future research directions examining the therapeutic potential of HB are offered.

Conclusions: Further research using more sophisticated methodologies than have been used to date will be necessary in order to confirm or refute the hypothesis that HB may be useful in treatment of psychiatric disorders.

INTRODUCTION

During the past few decades, voluntary hyperventilation has been used in clinical psychology and psychiatry as a means of triggering panic for diagnostic purposes and as part of desensitization therapies for anxiety disorders.[1,2] The procedure of voluntary hyperventilation has proven to be safe after medical screening for contraindicating conditions,[1–3] and has been demonstrated across numerous studies to be helpful in treatment of anxiety as a tool for diagnosis and desensitization.[1] Such uses for hyperventilation are consequently now part of standard treatments for anxiety disorders. Holotropic Breathwork (HB) is a novel, somatic, experiential psychotherapeutic procedure that involves a number of diverse elements including music, supportive touch, and elective bodywork (i.e., manually exerted pressure aimed at releasing muscular tension or spasm), and instructions to breathe "deeply and mindfully" throughout the session.[3] Sessions typically last much longer than talk-based psychotherapy sessions, usually ranging from 1 to 3 hours, terminated voluntarily by the client. Most elements of this treatment would appear to be best regarded

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as representing "common factors" of psychotherapy;[4] indeed, a competing hypothesis to ours would be that HB involves nothing but a set of already-understood, placebo-like elements that induce a nonspecific and mild therapeutic effect, much like that of a session of supportive psychotherapy, massage, relaxation, or prayer. However, one element of HB appears to be unique to this procedure, namely, that of prolonged, deliberate overbreathing. This aspect of HB would appear to capitalize upon the effects of hyperventilation on the central nervous system to facilitate development of a temporary, benign, and potentially therapeutic state of altered consciousness. The purpose of this paper is to pose the hypothesis that HB may a useful therapeutic modality in treatment of psychiatric disorders. We will review physiologic and psychologic effects of hyperventilation, along with preliminary evidence suggesting efficacy of HB. We will then pose a tentative, biopsychologic hypothesis of the underlying mechanism of putative effects of HB, and offer suggestions as to future studies examining this treatment.

NEUROPHYSIOLOGIC AND PSYCHOLOGIC EFFECTS OF HYPERVENTILATION

Hyperventilation is known to produce a characteristic series of behavioral and physiological changes associated with hypocapnia, a decrease in brain CO_2 partial pressure (P_{CO_2})[5,6] and concomitant increase in pH known as respiratory alkalosis, meaning excessive alkalinity of arterial blood.[6] Typical symptoms associated with respiratory alkalosis include dizziness, palpitations, and tingling/numbness of the extremities.[5,7] These symptoms form the basis of exposure procedures used in hyperventilation-enhanced treatment of anxiety disorders,[1] because they are similar to somatic symptoms of anxiety. At the more extreme levels of hypocapnia associated with prolonged hyperventilation, carpopedal spasms, meaning involuntary contractions of the muscles of the hands and feet, often emerge.[5] Such manifestations are known to be benign but are sometimes interpreted by the individual as signs of grave physical malfunctioning, leading to panic and consequent escalation of hyperventilation, the so-called "hyperventilation syndrome."[8–11]

Hypocapnia caused by hyperventilation has been demonstrated to induce changes in a range of neurophysiologic measures, including resting[12] and evoked[13,14] electroencephalographic (EEG) as well as magnetoencephelographic (MEG)[13,15] potentials, along with functional neuroimaging[16] and cerebral hemodynamics.[17] Briefly, resting EEG in hyperventilation has demonstrated slowing of brain activation rhythms across the brain, with substantial increases in lower frequency, δ- (up to 4 Hz) and θ- (4–8 Hz) activity.[12] Visually evoked potentials have been shown to be altered by voluntary hyperventilation, with increases in γ-band (30–45 Hz) responses to visual stimuli.[14] Long-latency (100–200 millisecond) auditory and somatosensory evoked potentials have been found to be suppressed after merely 3 minutes of voluntary hyperventilation;[13] similar reductions were found in evoked responses measured by cerebral MEG.[13] Direct-current MEG[15] has yielded evidence of an increase in mean global cortex excitability during hyperventilation.[15] Functional magnetic resonance imaging (fMRI) has demonstrated rapid decreases of up to 10% in MR signal within 20 seconds of initiation of hyperventilation in areas of the frontal, occipital, and parietooccipital cortex.[16] These changes are thought to reflect differences in cerebral metabolic activity and/or vascular regulation in these regions during hyperventilation.[16] Cerebral hemodynamic measurement has shown that within 20–30 seconds of voluntary hyperventilation, blood flow velocity decreases in cerebral arteries, along with increases in capillary pH, P_{O_2}, and oxygen saturation.[17]

Unsurprisingly, given the extent of the neurophysiologic changes just summarized, hyperventilation also has been shown to cause cognitive changes,[18] and when prolonged, to induce subjectively altered consciousness that corresponds temporally with the neurophysiologic changes.[19,20] Manifestations of altered consciousness emerging after approximately 8 minutes of hyperventilation have included ringing/roaring in the ears, clouded vision, and feelings of lightness, astonishment, and/or euphoria.[19] More dramatic changes in consciousness, including perceptual distortions and subjective "visions," have been reported after periods of hyperventilation exceeding 15 minutes.[19] With regard to a whole-brain conceptual model, such phenomena may be related to a "transient hypofrontality,"[21] meaning a brief period of unusually low activity in the frontal cortex that has been hypothesized to underlie a number of other altered states of consciousness,[21] such as those found in half-asleep states, meditation, exercise "highs," and some drug-induced states. It has been posited recently that there may be similar underlying neurobiologic changes associated with some altered states of consciousness.[22] Our hypothesis is based in part on the observation that prior research has found both hypocapnia[14,23] and certain anesthetic agents such as ketamine[24–26] to alter oscillation patterns of γ-range neuronal activity (30–45 Hz), as will be discussed further herein.

PRELIMINARY EVIDENCE OF CLINICAL UTILITY OF HOLOTROPIC BREATHWORK

Given the findings we have summarized thus far demonstrating clear effects of hypocapnia on neurophysiologic measures as well as subjective awareness, it would appear plausible that the prolonged, voluntary hyperventilation involved in HB might have some effect on symptoms of psychiatric disorders. What is at issue is whether such effects may be salutary, detrimental, or insignificant.

To date, few studies have examined empirically the therapeutic potential of HB. Only three studies appear to meet commonly accepted minimum criteria of methodological sophistication to be considered as constituting reliable empirical evidence (that is, those showing clear aims and hypotheses, standardized procedures, objective, quantitative measures with adequate and reported psychometric properties, some degree of control of potential confounds, and statistical analysis of results), and only one of these has been published in a peer-reviewed journal.[27] Holmes and colleagues (1996)[27] compared HB with talk-based, experientially oriented therapy (EOT). Participants were referred by a pool of clinicians who practiced EOT (such as Gestalt therapy). The authors examined two self-selected groups of 24 participants each, well-matched on demographic variables and extent of prior psychotherapy treatment (mean 82.7 months for the HB group and 55.8 months for the psychotherapy group); the HB group had experienced a mean of 7.6 prior HB sessions compared with none for the therapy-only group. Both groups were young to middle-aged adults (mean 39.3 and 36.2 years, respectively), were predominantly female (19 of 24 for both groups), and all were white. The HB group underwent six monthly HB sessions as well as weekly EOT sessions. The psychotherapy-only group received only the weekly EOT sessions, but were given an additional assessment after six additional sessions of psychotherapy as a control for the additional attention received by the HB group.

Both groups were assessed at three timepoints, once before the 6-month treatment period, once at the end of 3 months, and once at the end of 6 months. Measures of clinical improvement were selected based on the aspects of functioning considered by the authors to be those most relevant to experiential and existential therapies, including Templer's Death Anxiety Scale,[28] the Affiliation subscale of the Personality Research Form-E,[29] the Abasement scale from the Personality Research Form-E[29] to measure self-esteem, and an author-developed problems questionnaire that elicited the top three problems for which participants were seeking treatment, rated for severity on a Likert-type scale. The HB group showed significantly greater changes over time on dependent measures compared with the therapy-only group. *Post-hoc* analyses demonstrated that the HB group showed greater reductions in death anxiety on Templer's Death Anxiety Scale[28] and greater increases in self-esteem on the Personality Research Form-E[29] compared with the therapy-only group, controlling for number of prior psychotherapy sessions. Analyses including the additional assessment for the therapy-only group after six additional sessions yielded similar results. Groups showed equal changes over time on the problems questionnaire, suggesting that although HB plus EOT was more helpful than EOT alone in the therapist-identified areas of death anxiety and self-esteem, HB augmentation did not result in additional improvement in patient-identified problem areas. The authors comment that this controlled but nonrandomized trial provides some evidence that nonverbal aspects of experientially oriented therapies are important to efficacy, and that HB may be a useful adjunct to experientially oriented verbal psychotherapies, particularly for patients who have had many months of treatment with inadequate clinical response.

Pressman* conducted a controlled study of 40 participants matched for gender, ethnicity, and age, ranging widely on these variables. Participants were recruited by advertisement at a counseling center that conducts psychologic and spiritual counseling services and workshops. The study examined effects of HB on mood state (measured with the Profile of Mood States[30]) and psychiatric symptomatology (measured with the Brief Symptom Inventory[31]). Participants were assigned, based on matching, either HB or music therapy, with the latter including the same music and postural components of HB but omitting the voluntary hyperventilation and other accompanying components of HB. The music therapy group was offered debriefing as a substitute for the summary drawing that customarily concludes HB sessions. Both groups underwent one session of treatment every 2 weeks for a total of six sessions, and were assessed before and after the course of six sessions of treatment. Groups did not differ at baseline on mood state or psychiatric symptoms. The author found highly significant differences on all scales of the Profile of Mood States[30] in the HB group compared to the music group, signifying that a greater degree of altered consciousness was induced in the HB group.* Furthermore, although both groups were found to show improvements in psychiatric symptomatology on the Brief Symptom Inventory,[31] improvements were more consistent in the HB group, suggesting that the HB group received greater psychologic benefit from the six treatment sessions than did the music therapy group. No patients showed undesirable changes from pre- to post-treatment scores. This study thus offers modest, preliminary evidence that HB may be more psychologically beneficial than a common-factors[4]-based music therapy, and also provides additional evidence that, at minimum, the procedure does not appear to be detrimental to individuals seeking psychotherapy.

Hanratty,† in a one-group, repeated-measures, pre/post-test designed study with a 6-month follow-up timepoint, examined 44 participants at an international HB workshop. Study participants constituted 30% of the English-speaking workshop attendees; their mean age was 48.7 years. Participants were mostly (73%) female, and of a high educational level (100% had had some college; 51.5% held a master's

*Pressman TE. The psychological and spiritual effects of Stanislav Grof's Holotropic Breathwork technique: An exploratory study. San Francisco, CA: Saybrook Institute, 1993; unpublished dissertation.

†Hanratty PM. Predicting the outcome of Holotropic Breathwork Using the High Risk Model of Threat Perception. San Francisco, CA: Saybrook Institute, 2002; unpublished dissertation.

degree or higher). Dependent measures included the Tellegen Absorption Scale[32] and Marlowe-Crown Social Desirability Scale[33] to measure aspects of participants' personality, and the Positive and Negative Affect Schedule,[34] Templer's Death Anxiety Scale,[28] and the Brief Symptom Inventory[31] to measure aspects of psychiatric and psychologic distress. Participants received two HB sessions of approximately 3–4 hours' length over the course of 1 week. At post-test, participants were found to show significant reductions in negative affect as measured by the Positive and Negative Affect Scale,[34] and significant reductions of psychiatric symptoms on the Brief Symptom Inventory.[31] At 6-month follow-up (N = 22), mailed questionnaires indicated that reductions in overall psychiatric symptoms were maintained, although reductions in Negative Affectivity were no longer significant, and Positive Affectivity actually dropped significantly. The author speculates that the latter result may be attributed to a global reduction in arousal induced by HB. Participants were found to have elevated scores compared to established norms on the Positive Symptom total of the Brief Symptom Inventory[31] at all timepoints, suggesting that they represented, at minimum, a mildly psychiatrically distressed population. Interestingly, participants were also found to score higher on the Tellegen Absorption Scale[32] and Marlowe-Crown Social Desirability Scale[33] than the norm for the general population, indicating that participants in this study were unusually high in trait absorption and social desirability. The author suggests that high trait absorption and social desirability may predict positive response to HB. This study represents further preliminary evidence that HB may be psychologically beneficial, and specifically that it may reduce psychiatric symptoms in mild-to-moderately distressed, educated, white females.

HYPOTHESIZED MECHANISM OF ACTION OF HOLOTROPIC BREATHWORK

We have developed a tentative, biopsychologic hypothesis of putative psychotherapeutic effects of HB, drawing on laboratory findings in humans and animals concerning hypocapnia, which we will describe now as follows. We believe that the altered consciousness induced by prolonged, voluntary hyperventilation as well as the "set and setting" elements of HB involve a process of exposure to feared, internal, affective stimuli in the context of a supportive therapeutic setting, with resulting extinction of covert avoidance behaviors. This process of relatively sudden behavioral change is subjectively experienced by patients as "catharsis." Individuals who are considered to be suffering from refractory anxiety or depressive disorders, and/or those who may be conceptualized by their therapists as posing strong "resistance" to treatment, often experience fresh progress in psychotherapy after such experiences, with concomitant reduction in objective psychiatric symptoms. Such experiences are best conceptualized behaviorally as representing generalized extinction of internal, covert, avoidance behaviors on the part of the patient. A similar process has been demonstrated recently using the *N*-methyl-D-aspartate (NMDA) receptor agonist D-cycloserine administered acutely after exposure treatment for anxiety disorders.[35]

The NMDA antagonist ketamine has been implicated as a potential antidepressant agent[36–39] as well as a potentially useful adjunct to treatment of substance abuse disorders.[40] Studies using anesthetic agents in rat hippocampal tissue samples[24–26] have demonstrated that such agents disrupt γ-range (30–45 Hz) oscillations thought to serve a "binding" or associative function among distant populations of neurons, which may account for the dissociative effects of these drugs upon conscious awareness. Gamma activity occurs throughout the human brain in areas understood to be important to the state of subjective awareness, including the neocortex, hippocampus, and thalamus,[24] and appears to play a role in temporal modulation (i.e., timing control of action-potential generation across populations of neurons).[24] Although unproven at this time, the neuronal binding function of γ oscillation has been hypothesized to help maintain a normal state of consciousness in which activity across disparate brain areas occurs in tandem, "associated" rather than dissociated.[24–26] If supported by future research evidence, such a model would show that neuronal dissociation underlies psychologic dissociation. Similar disruptive effects on γ oscillations were found for anesthetic agents with diverse pharmacodynamics but similar effects on consciousness, including those that act on γ-amino-butyric acid (in the cases of thiopental, propofol, and morphine)[25] as well as NMDA receptors (ketamine).[25]

Under hypocapnic conditions, rat hippocampal tissue samples also have shown significant alteration in patterns of gamma oscillations.[23] Like ketamine and other anesthetic agents,[25] the prolonged, voluntary hyperventilation involved in HB may exert its primary action on consciousness via altering the temporal stability of gamma activity in key brain areas, consistent with effects on visually evoked γ responses found during voluntary hyperventilation.[14] Voluntary hyperventilation has been found to be associated with temporarily reduced MR signal in the frontal cortex that resolves quickly upon cessation of hyperventilation.[16] Disruption of stability of γ activity has been hypothesized to represent a neurophysiologic correlate of psychologic dissociation.[24–26] Under conditions of psychologic dissociation, one would expect alterations in normal patterns of regional cortical activation, particularly in the frontal lobes.[21] Indeed, transient hypofrontality has been theorized to underlie a range of altered states of consciousness,[21] all of which involve a degree of psychologic dissociation. Given that the frontal lobes are involved in control and selective inhibition of cognition and behavior, both hypocapnia and low-dose anesthetics may cause a temporary weakening of the inhibitory action

of the frontal lobes upon cognition and related subjective experience, resulting in disinhibition of previously avoided or "suppressed" internal stimuli.[21,41] Thus, dissociation and disinhibition may facilitate experiential exposure to feared internal representations. In the context of the supportive therapeutic conditions of HB, including several "common-factors" elements of psychotherapy as described herein, such exposure may result in extinction of the covert avoidance behaviors and thereupon, resolution of the consequent behavioral "resistance" that characterizes difficult-to-treat psychiatric disorders. Such an account would explain the preliminary results suggesting usefulness of HB specifically among individuals who have had many months of psychotherapy with inadequate clinical progress.[27] Alternatively, it is also possible that HB exerts psychotherapeutic effects via a more direct physiologic route, and that altered consciousness is epiphenomal and unimportant to any therapeutic effects. Such an argument has been made in the case of putative antidepressant effects of ketamine, which were found to occur several days after full return to normal consciousness.[36–38]

FUTURE RESEARCH DIRECTIONS AND CONCLUSIONS

We have argued that HB may exert its primary psychotherapeutic effects via a combination of psychologic mechanisms along with a hypothesized biopsychologic set of mechanisms we have described herein. We wish to suggest several potential future lines of research to test our hypotheses. First, a controlled study of HB using an adequate sample size and representing a diagnostically homogeneous clinical population as evaluated by standardized interviews would be needed in order to determine definitively whether HB should be considered a useful complementary or alternative treatment for common psychiatric disorders. Use of multiple, commonly used outcome measures with well-established psychometric properties, as well as inclusion of a placebo or wait-list control condition, with random assignment of participants to groups, would greatly enhance the interpretability of findings. Furthermore, it would be useful to explore which traits may predict response to HB, because traits such as social desirability and hypnotizibility have been implicated in a prior, unpublished study.† Mechanism of action of HB may be explored via psychophysiologic measurements concurrent with a clinical trial. Advanced neuroimaging techniques such as fMRI may be utilized further to provide more specific localization of brain activity changes during HB. To tease apart psychologic versus direct physiologic effects of hypocapnia, future studies may examine whether mere prolonged overbreathing, without other aspects of HB in place, would exert a similar treatment-augmentation effect. It is our view, however, that although hypocapnia may be the ingredient that sets HB apart from purely common-factors-based[4] interventions, hypocapnia alone is not likely to exert the same psychotherapeutic effects as HB.

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