Effects of Holorenic Breathwork on Anxiety and Heart Rate Variability: Preliminary Results

Efectos de la Respiración Holorénica en la Ansiedad y la Variabilidad de la Frecuencia Cardiaca: Resultados Preliminares

Julio Cervantes[1]
Club Natació Sabadell
Sabadell, Spain

Iker Puente[2]
Universidad Autónoma de Barcelona
Barcelona, Spain

Abstract

The purpose of this pilot study was to examine changes in physiological and psychological measures in a group of healthy volunteers following participation in a Holorenic Breathwork (HrcB) session. A single group, pretest/posttest design was used. A total of 11 subjects, aged 30-47 participated in the study. Inclusion criteria were as follows: +18 years, Spanish speaking and no know-diagnosed mental disorder. The intervention consists in a single HrcB session. The psychological measures included the State-Trait Anxiety Inventory (STAI). Physiological measures included the HRV. Participants completed the psychological assessments and provided a HRV measure at baseline (pre-HB), and within 15-30 minutes after the HB session (post-HB). Significant improvements in HRV, as well as reductions in the state anxiety level, were observed from baseline to post-HB. Reductions in state anxiety levels were associated with reductions in the HRV levels. Thus, positive improvements in levels of anxiety were associated with increased HRV levels.

Keywords: holorenic breathwork, hyperventilation, HRV, STAI, state anxiety.

Resumen

El propósito de este estudio piloto fue evaluar los cambios en ciertas medidas fisiológicas y psicológicas en un grupo de voluntarios sanos después de la participación en una sesión de Respiración Holorénica (RHrn). Se empleo un diseño pretest /postest de un solo grupo. Un total de 11 sujetos de entre 30 -47 años participaron en el estudio. Los criterios de inclusión fueron los siguientes: +18 años, hablar en español y ausencia de diagnóstico de trastorno mental. La intervención consistió en una única sesión de RHrn. Las medida psicológica de ansiedad se realizó empleando el Inventario de Ansiedad Estado-Rasgo (STAI). La medida fisiológica estudiada fue la Variabilidad de la Frecuencia Cardiaca (VFC). Los participantes completaron las evaluaciones psicológicas y proporcionaron una medida de la VFC en el momento basal (pre-RHrn), y unos 15-30 minutos después de la sesión de RHrn (post-RHrn). Se observaron mejoras significativas en la VFC, así como reducciones en el nivel de ansiedad estado entre las medidas pre-RHrn y post-RHrn. Las reducciones en los niveles de ansiedad estado se asociaron con reducciones en los niveles de la VFC. Así, las mejoras positivas en los niveles de ansiedad se asociaron con un aumento de los niveles de la VFC.

Palabras clave: respiración holorénica, hiperventilación, variabilidad de la frecuencia cardiaca, STAI, ansiedad estado.

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Introduction

A very wide range of breathing procedures have been used for centuries in many cultures and different contexts, including healing and ritual purposes. It has also been known for a long time with techniques that involve modification in breathing rate (including acceleration and retention) can induce changes in consciousness (Grof and Grof, 2010). Different specific techniques of breathing can be found, in the *Pranayama* yogic breath techniques (Vishnudevananda, 1974), in *Kundalin*i Yoga, Sufi practices, Zen meditation, and in *Vipassana*. Techniques that involve accelerated breathing or hyperventilation can be found in the Inuit's, Sufis, in some Native American groups and in the Pranayama (Desikachar, 1985).

In the modern Western culture, however, these types of breathing methods have not been accessible to most. Western medicine has in fact reduced breathing to a physiological process, and physical and psychological signs that appear when the breathing rate is accelerated (which include hypocapnia[1], palpitations, dizziness and carpopedal spasm) have been considered a pathological condition know as the "hyperventilation syndrome" (Morgan, 1983). This term has been controversial since it was introduced, most of the disagreement being centered on the difficulties in establishing a diagnosis (Bass, 1997). In the second half of the XX century, many techniques involving accelerated breathing were developed in different psychotherapeutic approaches (Grof and Grof, 2010; Lowen, 1976; Orr and Ray, 1983). Furthermore, during the last few decades, voluntary hyperventilation has been used in clinical psychology and psychiatry as part of some desensitization therapies for the treatment of anxiety disorders, and has been found to be safe after medical screening for some contraindicated conditions (Meuret et al, 2005; Zvolensky and Eifert, 2001). Thus, hyperventilation is now considered a useful tool for the treatment of anxiety disorders.

In this context, Stanislav Grof, developed the Holotropic Breathwork technique the mid 1970´s (Grof, 1988, 2000; Grof and Grof, 2010), after two decades working with LSD and other psychedelic substances in psychotherapy (Grof, 1972, 1973, 1975, 1980). This method was conceived as a non-drug way of accessing non-ordinary states of consciousness or "holotropic states", a neologism proposed by S. Grof[2] (2000). Holotropic Breathwork (HB) is a experientially oriented psychotherapeutic technique that involves diverse elements, including evocative music, elective bodywork and accelerated breathing. Individual and group sessions are possible, but the group therapy context is the most commonly used. The most characteristic element of this procedure, compared with other psychotherapeutic methods, is the prolonged, voluntary hyperventilation or overbreathing (Rhinewine and Williams, 2007). To date, few studies have examined empirically the therapeutic potential of this hyperventilation procedure. However, there is some preliminary evidence of the clinical utility of HB (Binarova, 2003; Brewerton et al, 2012; Eyerman, 2013; Hanratty, 2002; Holmes, 1996; Pressman, 1993; Puente, 2013, 2014a, Puente, 2014b).

Similar hyperventilation procedures have been developed as well. In the late 80´s, the anthropologist Josep Maria Fericgla developed Holorenic Breathwork (HrnB), a technique based in the *Kapalabhati* breathing, different shamanic and Sufi breath methods, and HB. HrnB consists in an increased breath rhythm, reaching to 140-160 breaths per minute, involving other elements, including evocative music and elective bodywork (Fericgla, 2000; 2006). HrnB sessions usually last between 2 and 3 hours, and are terminated voluntarily by the client. There are some differences between HB and HrnB, including the rhythm and the instruction of the breath, the structure of the music set, and the type of bodywork, but both can be considered very similar methods, based mainly in the use of the prolonged and voluntary hyperventilation, and including the use of music and the elective bodywork.

Recently Puente (2007, 2013, 2014a) examined the effects of HrnB in a controlled, non-randomized study, using a pretest-posttest design. The study compared a group of subjects, aged 18-35, who participated for the first time in a weekend workshop where HrnB was used, with a control group that did not receive any alternative treatment. Both groups (N=31) were matched by age, gender and level of studies. The HrnB group showed a significant reduction in the Global Severity Index of the SCL-R-90, and a significant increase in the meaning of life (measured with the Puropose in Life Test) and in the self-directedness, cooperativeness and self-transcendence dimensions of the TCI-R, one-week, one month and six months after participating in the HrnB workshop.

Heart rate variability (HRV) represents the beat-to-beat variation in heart rhythm. These variations in HRV are regulated by the autonomic nervous system. Higher HRV indicates cardiovascular health and greater parasympathetic control status (Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology, 1996). Low HRV is an established predictor of cardiovascular morbidity and mortality and low parasympathetic control (Dekker, et al., 2000; Kleiger, et al., 1987).

An association between emotional disorders and autonomic function has been proposed (Friedman and Thayer, 1998). Evidence in clinical (Berntson et al., 1994; Friedman, 2007; Lane, Adock, and Burnett, 1992) and sport (Cervantes et al, 2009) research reinforce the utility of the HRV to assess the reduction in parasympathetic function related to several anxiety forms (Friedman and Thayer, 1998; Kawachi et al., 1995). As well, different authors have demonstrated that participation in alternative therapeutic sessions can acutely increase HRV. It has also been demonstrated that specific breathing pattern, specially low frequency, produce psychophysiological health effects related to the stress-anxiety (Cappo and Holmes, 1984; Gavish, 2010**).** However, there are currently no data to suggest that HrnB can obtain these effects.

We hypothesize that a single HrnB session will increase HRV, indicating a greater parasympathetic (vagal) function, and that this positive change will be accompanied by a reduction in anxiety.

Method

Participants

In this pilot study, a convenient sample was used. Eligible participants were individuals enrolled in a weekend HrnB workshop at a wellness and personal growth center. Eligibility criteria were as follows: 18 years of age or older, Spanish speaking, with no previous serious mental health problems and able to provide informed consent. Because the primary outcome involved HRV data, the measurement errors and ectopic heartbeats were visually checked and eliminated manually.

All the participants in the workshop who completed the inclusion criteria (N=25) were approached about participating in the study. From the 25 who were asked, 13 declined to participate, leaving 12 individuals who were interested. Of the 12 individuals, all consented and completed study assessments prior to the first HB session. One individual dropped out in the post measure for the HRV measure, and 4 for the STAI.

Participants in the study (N=12) age ranged between 30 and 47 years (Mean=45.2, S.D. =12.01). 41.7 percent of the participants were female (N=5) and 58.3 were male (N=7). Participant who completed the HRV measure at post-test (N=11) ranged in age from 30 to 47 years old. Five of them were female (45.5%) and six were male (54.5%). Participant who completed the STAI measure at post-test (N=8/9/10) ranged in age from 30 to 47 years old. Five of them were female (50%) and five were male (50%) (see Table 1).

Procedure

The data was collected in the context of a weeklong workshop. The workshop was held at a human development center near Barcelona, in May 2010, and the researcher stayed at the center for the entire weekend to collect the data. Participants received one HrnB session during the workshop. Permission to conduct the study was requested from and granted by the organizer and the directors of the workshop. After the introductory talk of the workshop, all the participants were invited to participate in the research. Participation in the study was completely voluntary. Written informed consent was obtained prior to the baseline assessments. At baseline, participants completed the STAI-psychological questionnaire, and they also completed also a HRV measure. Pre-test assessments were obtained within 15-60 minutes prior to the HrnB session. At posttest, participants completed the STAI-psychological questionnaire and another HRV measure. Post-test assessments were obtained within 15-30 minutes following the HrnB session (for the HRV measure) and between 30- 120 minutes after the HrnB session for the STAI. At post-test, we were not successful in obtaining follow up data for the STAI from 2-3 of the volunteers and for 1 of the volunteers for the HRV measure.

The HrnB session, modeled after the program created by Stan Grof, is a standarized, group based intervention. The session was 2.5-3 hours in length.

Table1. Age, gender and education for the study volunteers.

		Pre measure (N=12)	*Post1 measure HRV (N=11)*
Age		45.2 (12.01)	39.8 (5.04)
Gender	Man	7 (58.3%)	6 (54.5%)
	Woman	5 (41.7%)	5 (45.5%)
Education	College finished	6 (50%)	5 (45.45%)
	College unfinished	0	0
	High School	5 (41.7%)	5 (45.45)
	Primary studies	1 (8.3%)	1 (9.1)

Study Design

In the present study, a single group, Pretest-Posttest design was used. The variables examined were measured with one psychometric measure of anxiety, the *State-Trait Anxiety Inventory (STAI*), and with one physiological measure of the Heart Rate Variability (HRV), using the *Heart Rate Monitor* (Polar S-810i).

Psychological Measures

Anxiety was measured using the *State-Trait Anxiety Inventory* (STAI). The STAI is a commonly used, highly reliable, brief 40-item self-rating scale for the assessment of anxiety. This inventory is comprised of two separate self-report scales that measure two independent concepts of anxiety, state (S) and trait (T). Each of the scales has 20 items on a Likert scale from 0 to 3 (range: 0-69; cut off point: 31) (Spielberger, Gorsuch and Lushene 1970; Spielberger, Gorsuch, Lushene, Vagg, and Jacobs, 1983). The STAI State assesses how respondents feel "right now, at this moment" (e.g., "I feel at ease"; "I feel upset"), and the STAI Trait targets how respondents "generally feel" (e.g., "I am a steady person"; "I lack self- confidence"). State anxiety is defined as a transitory emotional state or condition of the human organism characterized by subjective feelings of tension and apprehension and by autonomic hyperactivity. It is variable in duration and intensity. Trait anxiety is defined as a personality disposition that describes a person's tendency to perceive situations as threatening, and hence to experience state anxiety in stressful situations. Trait anxiety is not observed directly, but is expressed as state anxiety when stress is experienced. The Spanish version was adapted by Seisdedos (2002). Internal consistency coefficients for the scale have ranged from .86 to .95; test-retest reliability coefficients have ranged from .65 to .75 over a 2-month interval (Spielberger et al., 1983). The normative data for the Spanish adaptation differs from the original data for the American version. The reported mean (S.D.) values reported for State anxiety in the normal population are 20.54 (10.56) for male adults and 23.30 (11.93) for female adults (Seisdedos, 2002).

Physiological Measures

Hearth Rate Variability (HRV) was measured using the *Heart Rate Monitor* (Polar S-810i). Subjects wore a Polar Heart Rate Monitor (Polar S-810i) with elastic electrode belt (*Polar Electro Oy*, validated in the study by Gamelin, Berthoin and Bosquet, 2006), below the solar plexus, with a conductive gel being applied as described by the manufacturer, in order to detect the R-R intervals with a resolution of 1 ms. The 10 minute recordings of the RR intervals were transferred to a personal computer using Polar Precision Performance Software (Version 4.03.041, Polar Electro, Finland). After correcting for possible recording errors, the RR intervals were exported to the HRV Analysis Software (Version 1.1 SP1, University of Kuopio, Finland) to analyse the HRV using the parameters summarised below.

With *time domain* HRV variables it is possible to obtain information about the health status, and with *frequency domain* it is possible to provide quantitative estimates of sympathetic and vagal (parasympathetic) neural influences on the heart. *Time domain* indices include HRVmean (RRmean) and RMSSD. *Frequency domain* indices include HF and low frequency (LF)

Table 2. The mean, standard deviation and significance for the Wilcoxon signed-rank test for the Pre-test and Post1 are presented.

Measures	*Subscale*	*Pre-test*	*Post1-test*	*P value*
STAI	STAI-State	16.09 (5.92)	11.38 (5.75)	**0.012**
	STAI-Trait	25.45 (8.14)	21.44 (5.03)	0.44
HRV				
Time domain	RRmean	704.70 (82.84)	800.64 (120.96)	**0.026**
	RMSSD	19.26 (7.07)	36.80 (36.09)	**0.041**
Frequency domain	HFms	320.08 (210.91)	1536.56 (3035.58)	**0.041**
	LFms	208.96 (133.1)	393.19 (391.46)	0.062
	LF/HF	0.77 (0.39)	0.95 (1.18)	0.534

Note: Data are mean scores with the SD shown in parenthesis.
STAI: State-Trait Anxiety Inventory; HRV: Heart Rate Variability; RRmean: mean of time series of beat-to-beat time differences; RMSSD: square root of the mean of the sum of the squares of differences between adjacent RRI; HFms: high frequency power (0.15–0.40 Hz); LFms: low frequency power (0.04 0.15 Hz); LF/HF: low frequency to high frequency ratio.

power and LF: HF ratio, and were calculated from 5 minutes of RR intervals recording.

Statistical Analysis

Data were analyzed using the 17.0 version of SPSS. Changes in psychological and physiological measures from pre to post-HB were analyzed using a non-parametric statistical test: the Wilcoxon signed-rank test.

Results

Baseline Measure

At baseline, a mean (S.D.) score of 16.09 (5.92) was obtained for the State scale, and a mean (S.D.) score of 25.45 (8.14) was obtained for the Trait Scale. In the *time domain* measures of the HRV, the RRmean index was 704.7 (82.84), and the RMSSD 19.26 (7.07). In the *frequency domain*, the HFms index score was 320.088 (210.91), and the LFms score was 208.96 (133.1). Finally, the LF/HF parameter score was 0.77 (0.39). (See Table 2).

Post-test measure assessed after the HrnB session.

Anxiety. In the Post1 measure, the participants showed a significant ($p = 0,012$) reduction in the State scale of the STAI (N=8-9) compared with the Pre-test score. The scores of the Trait scale also decreased, but the difference was not statistically significant.

Time domain HRV analysis. A significant increase in the post-test was noticed for the RRmean ($p = 0.026$) and the RMSSD ($p = 0.041$) indexes.

Frequency domain HRV analysis. In terms of the indexes related to parasympathetic activity, a significant decrease was found in the HF ms^2 ($p = 0.041$). Significant differences for sympathetic activity related parameters were found in terms of the decrease of the LF ms^2 ($p = 0.062$). Whereas, an increase with a tendency towards significance ($p = 0.053$) was observed for sympathetic activity related parameters in terms of the decrease of the LF/HF %, which expresses the proportion between low frequencies and high frequencies.

Discussion

The purpose of the present study was to explore the effects of HrnB on anxiety and HRV. The overall results of this pilot study provide some initial positive findings regarding the possible therapeutic usefulness of this technique in the context of a weekend workshop. In the present study, the volunteers showed some significant changes on dependent measures from baseline to post-HrnB measures, including significant improvements in HRV as well as significant reductions in the state anxiety level were observed from baseline to post-HrnB measures. Reductions in state anxiety levels were associated with improvements in the HRV levels. Thus, positive improvements in levels of anxiety were associated with increased HRV levels.

At baseline, volunteers in the study shown moderately low scores on the anxiety-state scale of the STAI, compared with the values reported in the normal population in anxiety-trait scale scores were similar to the scores found in the general population (Seisdedos, 2002). With regards to the state and trait levels of anxiety, a significant reduction of the anxiety-state scale of the STAI, and the non-significant reduction of the anxiety-trait scale was found after the HrnB session. These findings are consistent with the research on the topic. Puente (2007; 2014a) found a significant reduction in the rating of the anxiety subscale and the Global Severity Index of the SCL-90-R one month after an HrcB weekend workshop (N=31), and also a significant reduction of the GSI at 6 months follow-up. Hanratty (2002) also found a significant reduction of the GSI of the BSI test, and a non-significant reduction of the anxiety subscale, one week and six months after a weeklong HB workshop. Pressman (1993) also found a significant reduction of the GSI and the anxiety subscale of the BSI after six HB sessions (N=20). Puente also found a significant reduction of the GSI and the anxiety subscale of the BSI (N=22) two weeks and four months after a weeklong HB workshop (Puente, 2010), and also a non significant reduction of the anxiety subscale of the BSI and the GSI four weeks and six months after a weeklong HB workshop in a young sample in a previous pilot study (N=16) (Puente, 2014b).

Besides that, voluntary hyperventilation has been demonstrated over different studies to be a helpful tool for diagnosis and desensibilization in the treatment of anxiety (Meuret et al, 2005), and has been found to be safe after medical screening for some contraindicated conditions (Meuret et al, 2005; Zvolensky and Eifert, 2001). Thus, hyperventilation is now part of the tools for the treatment of anxiety disorders (Rhinewine and Williams, 2006).

HRV 5-min data collected were analyzed in time-domain and frequency-domain to determine the autonomic nervous system (ANS) activity, which represents the level of psychophysiological health status (Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology, 1996). Similar to previous breathwork therapies studies (Pressman, 1993; Puente, 2013, 2014a), our results by comparing HRV indexes in pre-test vs. post-test confirm the positive effect of the HrnB session on the HRV.

Especially in the context of anxiety, and according with Friedman (2007) and Cohen and Benjamin (2006), our results suggest that specific patterns of autonomic response could be observed with the analysis of heart rate variability. After the HrnB session, accompanied by reduction in anxiety, HRV parameters showed the expected change: there was an increment of parasympathetic activity (greater values in HFms and RMSSD); an increment of parasympathetic predominance (lower values in LF/HF ratio); and a decrement of sympathetic activity (lower LFms).

Despite some initial positive findings suggesting that the use of HrnB in the context of a weekend workshop might present therapeutic value for the treatment of anxiety, the present study has several limitations.

The first limitation of the present research is related to the type of design. A convenient sample was used for the present study, and there was no comparison group. As the study was quasi-experimental, we cannot draw cause-effect statements from it. The second limitation is the small sample size, decreasing the statistical power and increasing the probability of false positive results. Thus, the results cannot be generalized, but they do support the idea that HrnB may contribute to improving psychological health, reducing the levels of anxiety and inducing positive changes in some HRV parameters, including an increment of parasympathetic activity and predominance, and a decrement of sympathetic activity.

Conclusion and Future Projects

Further research on the effects of HrnB on anxiety and HRV is needed. There are a number of areas of potential interest that might be examined in future research, including the combined assessment of physiological and neurophysiologic variables. The development of similar studies in other contexts where HrnB and other similar hyperventilation procedures are used could be very fruitful. Finally, in order to investigate the usefulness of HrnB, beyond what appears to be some initial positive results found in the present study, we consider it is important to replicate these results in a larger, well-controlled study. A placebo-controlled, randomized study assessing the efficacy of HrnB in patient populations, for the treatment of a particular condition linked with anxiety, could be designed and carried out as the next step.

Notes

1. Hypocapnia, a decrease in brain CO2 partial pressure, is associated with hyperventilation, and different studies have shown that it induces changes in different neurophysiologic measures, including evoked potentials and functional neuroimaging (Huttunnen, Tolvanen, Heinonen et al, 1999; Jensen, Hari and Kaila, 2002; Posse, olthoff, Weckesser et al, 1997).

2. The word “holotropic” is derived from the Greek words “holos” and “trepein”, and means “moving toward wholeness” (Grof, 2000).

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[1]**Julio Cervantes** is a psychologist and sport trainner from Club Natació Sabadell (CNS), were he worked in the D. T. Triatlon section. He holds a degree in psychology from the Universidad Veracruzana (UV) and a Master in Sport Pshychology from the Autonomous University of Barcelona (UAB). He obtained his PhD degree from the UAB with his dissertation: “Heart Rate Variability, Stress and Sport: psycho physiological evaluation applied to training and competition”. He was a Master teacher in UAB at the Sport Psychology Master. He has participated in R+D projects as a research collaborator.
Email: juliocerva@hotmail.com

[2]**Iker Puente** is a s a psychologist and researcher from the Autonomous University of Barcelona (UAB). He holds a degree in psychology from the University of Deusto and a degree in anthropology from the UAB. He recently obtained his PhD degree in psychology at the UAB with his dissertation “Complexity and Transpersonal Psychology: chaos, self-organization and

peak experiences in psychotherapy", exploring the short and medium term effects of two breathwork techniques; Holotropic Breathwork (HB) and Holorenic Breathwork (HrnB), and the subjective effects of HB. He is assistant editor of the Journal of Transpersonal Research. He has been trained in Gestalt Therapy at the Institut Gestalt in Barcelona, in Altered States of Consciousness at the Society of Etnopsychology and Cognitive Studies, and in Holotropic Breathwork and Transpersonal Psychology at the Grof Transpersonal Training. He has been visiting scholar at the California Institute of Integral Studies (CIIS), coordinator of the psychedelic emergency service at BOOM festival, and has teaching experience in the field of transpersonal psychology.
Email: ikerpuente@hotmail.com