

EXPLORING HOLOTROPIC BREATHWORK: AN EMPIRICAL EVALUATION OF ALTERED STATES OF AWARENESS AND PATTERNS OF PHENOMENOLOGICAL SUBSYSTEMS WITH REFERENCE TO TRANSLIMINALITY

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ABSTRACT: It is a long-standing assumption that holotropic breathwork (HB) induces an altered state of consciousness. However, this assumption has not been empirically tested. Consequently, 32 participants were recruited for the present study, which aimed to use the *Phenomenology of Consciousness Inventory* (PCI) to quantify the pattern of phenomenological subsystems and Altered State of Awareness (ASA) scores associated with a HB condition relative to a comparison condition and a baseline assessment. The hypothesis that the HB group would report a different pattern of relationships among phenomenological subsystems relative to the comparison condition and baseline was partially supported. In addition, the hypothesis that, while controlling for baseline, the HB group would report higher ASA scores than the comparison group was supported. Finally, for the HB group, transliminality did not significantly improve the prediction of ASA, while controlling for baseline. Various suggestions for future research are discussed.

KEYWORDS: altered state of awareness, holotropic breathwork, phenomenology, Phenomenology of Consciousness Inventory, transliminality.

The term ‘holotropic’ (from the Greek ‘*holos*’ meaning whole and ‘*trepein*’ meaning to move toward) was coined by Stanislav Grof (1988, 1998) to denote a state of being that is ‘oriented toward wholeness.’ Grof (1998) explained that holotropic states involve transformations in consciousness as we “experience an invasion of other dimensions of existence” (p. 344). Such states can be profound and overwhelming and can be characterized by dramatic sensory and

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perceptual changes, intense and unusual emotions and behavior, alterations in thought patterns, and psychosomatic manifestations. However, Grof asserted that such states are qualitatively different to pathological non-ordinary states of consciousness, such as those relating to cerebral trauma, infections, or degenerative and circulatory brain processes.

Holotropic Breathwork (HB) is a technique that was developed by Grof and his wife Christina in the 1970s (Grof & Grof, 2010). It is designed to facilitate non-ordinary, or holotropic, states of consciousness without the use of pharmacologic means. Instead, it combines rapid, deep breathing, evocative music, focused bodywork, and artistic expression within a safe, supportive group environment. According to Grof and Grof, non-ordinary states of consciousness facilitate an ‘inner radar’ that is able to detect emotionally charged material and bring it into consciousness for processing and subsequent healing.

HB has been studied in the context of addiction recovery (Brewerton, Eyerman, Cappetta, & Mithoefer, 2012; Jefferys, 1996; Metcalf, 1995; Taylor & Macy, 2008), death anxiety and self-esteem (Holmes, Morris, Clance, & Putney, 1996), personality (Binarova, 2003), mood states and psychiatric symptomatology (Hanratty, 2002; Pressman, 1993), and respiratory (Terekhin, 1996) and neurophysiological (Spivak, Kropotov, Spivak, & Sevostyanov, 1994) activity. For example, Pressman (1993) conducted an experiment designed to comparatively analyze the effects of HB and music therapy on mood states. While groups did not differ at baseline, the author reported statistically significant post-test differences between the HB and the music therapy group on all sub-scales of the *Profile of Mood States* (McNair, Lorr, & Droppleman, 1971). Rhinewine and Williams (2007) suggested that this result signifies “that a greater degree of altered consciousness was induced in the HB group” (p. 773).

In another study, Holmes et al. (1996) comparatively analyzed HB and experientially oriented therapy (EOT) regarding numerous outcome variables. The authors reported statistically significantly greater post-test reductions in death anxiety (measured by *Templer’s Death Anxiety Scale*; Templer, 1970) and statistically significantly greater increases in self-esteem (measured by the *Personality Research Form E*; Jackson, 1984) for the HB group compared to the EOT group.

In a subsequent unpublished HB study, Hanratty (2002) implemented a single-group, within-subjects, pre/post-test design. The author reported statistically significant post-test reductions in negative affect and psychiatric symptoms as quantified by the *Positive and Negative Affect Scale* (Watson, Clark, & Tellegen, 1988) and the *Brief Symptoms Inventory* (Derogatis & Spencer, 1987), respectively.

Underpinning the HB literature is the long-standing assumption that HB induces a non-ordinary or altered state of consciousness (ASC) (e.g., Grof & Grof, 2010). For example, Rhinewine and Williams (2007) suggested, “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” (p. 772). Similarly, Brewerton et al. (2012) stated, “HB offers the addict many opportunities that may enhance addiction treatment, including entering non-ordinary states of consciousness...” (p. 453).

CONCEPTUALIZING (ALTERED) STATES OF CONSCIOUSNESS

Ludwig (1969) defined ASCs as “any mental state(s), induced by various physiological, psychological, or pharmacological manoeuvres or agents, which can be recognized subjectively” (p. 9). Ludwig also identified a variety of general characteristics exhibited by ASCs, e.g., hypersuggestibility, a sense of ineffability, and a loss of volitional control. Unfortunately, as Rock and Krippner (2007a, 2007b) pointed out, Ludwig’s (1969) definition neglects to operationalize the notion of a “*sufficient deviation* in subjective experience” (italics added; pp. 9-10). Furthermore, Ludwig did not identify the “general norms” related to ordinary waking states (Rock & Krippner, 2007a, 2007b).

In contrast to Ludwig (1969), Krippner (1972) formulated a definition of ASCs that eliminates the problems associated with operationalizing the qualifying term “sufficient.” Krippner (1972) defined an ASC as “a mental state which [that] can be subjectively recognized by an individual (or by an objective observer of the individual) as representing a *difference* in psychological functioning from the individual’s ‘normal’ alert state” (p. 1).

Similarly, Tart (1969) defined an ASC for a given individual as one in which he or she experiences a

qualitative shift in his pattern of mental functioning, that is, he feels not just a quantitative shift (more or less alert, more or less visual imagery, sharper or duller, etc.), but also that some quality or qualities of his mental processes are *different*. (p. 1)

(Examples of qualities may include alterations in space-time perception, visual hallucinations, and the dissolution of one’s ego.) One may contend that Tart’s decision to include both quantitative and qualitative differences in cognitive functioning within the definitional boundaries of the acronym ASC, renders his formulation of the concept superior to Krippner’s (1972) attempt at operationalization.

Subsequently, Fischer (1971, 1972, 1976) developed a perception-meditation continuum that allows one to distinguish between ergotropic and trophotropic arousal. These refer, respectively, to hyperaroused (ecstatic) states and the “hypoaroused states of Zazen and Yoga samadhi” (Fischer, 1971, p. 897).

It is noteworthy that Tart (1975) argued that the term “states of consciousness” (and its variant, “altered states of consciousness”) “have come to be used too loosely, to mean whatever is on one’s mind at the moment” (p. 5). Consequently, Tart developed the term “discrete states of consciousness”

(d-SoCs) in an attempt to rectify this terminological problem. A d-SoC refers to a “unique configuration or system of psychological structures or subsystems ... that maintains its integrity or identity as a recognizable system in spite of variations in input from the environment and in spite of various (small) changes in the subsystems” (Tart, 1975, p. 62). Pekala (1985) asserted that, from Tart’s perspective, it is the *pattern* or configuration of these different structures or subsystems (i.e., phenomenological elements) that constitutes a d-SoC. In contrast, Singer (1977) suggested that it is the *intensity* of these different elements, rather than the pattern, that defines a d-SoC. Pekala and Wenger (1983) synthesized the essential aspects of Tart’s and Singer’s conceptions to define a state of consciousness (SoC) as the “particular intensity and pattern of associated phenomenological parameters that characterize one’s subjective experience during a given time” (pp. 252-253).

We emphasize that to date, and to the best of our knowledge, the assumption that HB induces an ASC has not been verified empirically in the context of a controlled evaluation. In the next section we will describe a quantitative phenomenological instrument derived in part from Tart (1975) and Singer (1977) that allows one to test the hypothesis that HB induces an ASC.

THE PHENOMENOLOGY OF CONSCIOUSNESS INVENTORY

HB experiences may be quantified using a methodology that was developed by Pekala (1985) to “operationally define, map and diagram states and altered states of consciousness” (p. 207).¹ This methodology consists, in part, of a novel retrospective phenomenological assessment instrument referred to as the *Phenomenology of Consciousness Inventory* (PCI) (Pekala, 1991). The PCI is a 53-item questionnaire consisting of 12 major dimensions or phenomenological (i.e., subjective) elements (e.g., Positive Effect, Altered Experience, Visual Imagery, Altered State of Awareness, Rationality), and 14 minor dimensions (e.g., Fear, Joy, Altered Body Image, Absorption).

The PCI allows one to define operationally or ‘map’ phenomena typically referred to as d-SoCs or ASCs by producing “psygrams” (graphs) that provide two types of information associated with exposure to a stimulus condition: (a) the average intensity values (ranging from 0–6) for each PCI major dimension, and (b) the strength of the association between pairs of PCI major dimensions (Pekala, & Kumar, 1986). One creates a psygram by first producing a correlation matrix consisting of the 12 PCI major dimensions. The non-significant correlation coefficients ($p > .05$)² are ignored, whereas significant r values are converted to r^2 values (i.e., coefficients of determination). Subsequently, the r^2 values are converted to percentages. Each line linking a pair of major dimensions constitutes 5% of the r^2 or variance in common (i.e., covariance) (Pekala, 1991). Thus, the higher the r^2 , the stronger the coupling between a given pair of major dimensions.³

The performative function of a psygram is aligned with Tart’s (1975) notion of a d-SoC. As previously stated, Pekala (1985) asserted that, in Tart’s view, it is the

pattern formed by these various psychological subsystems that comprises a d-SoC. Consequently, if the psygram associated with a baseline or comparison condition is statistically significantly different from a psygram associated with, for example, a HB condition, then one may conclude that the HB condition was associated with a “major reorganization in pattern structure that is hypothesized by Tart (1975) to be associated with an altered state of consciousness” (Woodside, Kumar, & Pekala, 1997, p. 84). That is, the pattern structure of the d-SoC associated with the HB condition would be considered statistically significantly altered relative to the pattern structure of the d-SoC associated with the comparison condition or baseline assessment. In contrast, from Singer’s (1977) perspective, if a HB group reports statistically significantly higher intensity values on the PCI major dimension of Altered State of Awareness compared to a comparison group or baseline, then the HB group has reported an ASC.

The PCI has been used to map and diagram phenomenology facilitated by progressive relaxation (e.g., Pekala, Forbes, & Contrisciani, 1989), hypnosis (e.g., Kumar & Pekala, 1989; Pekala & Kumar, 1984, 1986, 1989), sitting quietly with eyes closed (e.g., Pekala & Kumar, 1989), and shamanic-like journeying experiences (e.g., Rock, Casey, & Baynes, 2006; Rock, Abbott, Childargushi, & Kiehne, 2008; Rock & Storm, 2010; Rock, Storm, Harris, & Friedman, 2013). However, to date, there exist no studies that have applied Pekala’s (1985) methodology to map the phenomenological effects of a HB stimulus condition.

TRANSLIMINALITY

Little is known about individual susceptibility to the effects of HB. The intended effects of HB (i.e., altered or non-ordinary states of consciousness) may purportedly facilitate such experiences as the recall of repressed traumatic memories and past life memories, meaningful interpretation of dream content, the reliving of biological birth and experiences of psychospiritual death and rebirth, encounters with archetypal figures, and feelings of cosmic unity (Grof & Grof, 2010). Individual susceptibility to such states may be associated with various personality traits. One potentially relevant personality trait is transliminality.

Transliminality is defined as the “hypothesized tendency for psychological material to cross (*trans*) thresholds (*limines*) into or out of consciousness” (Thalbourne & Houran, 2000, p. 853), both from unconscious sources and the external environment (Thalbourne & Delin, 1994). Transliminality has been found to underlie paranormal belief, mystical experience, manic experience, magical ideation, absorption (i.e., a tendency to become deeply engaged in mental imagery) (Tellegen & Atkinson, 1974), fantasy proneness (Myers, 1983), hyperaesthesia (i.e., hypersensitivity to sensory stimulation), and positive attitude towards dream interpretation (Thalbourne, 1998; Thalbourne & Delin, 1994).

In a study investigating the links between HB and various trait-like tendencies, Binarova (2003) reported that HB facilitated reductions in rigidity and dogmatism. Binarova also reported that ‘Breathers’ tended to display a greater tendency toward magical thinking and unconventionality than ‘Non-Breathers.’

Additionally, Hanratty (2002) found that HB participants scored higher on trait absorption than the general population. With these findings in mind, it seems reasonable to suggest that individuals who display high levels of transliminality may be more susceptible to the intended effects of HB.

AIMS AND HYPOTHESES

The aim of the present study was to investigate the pattern of phenomenological sub-systems and Altered State of Awareness (ASA) intensity scores associated with a HB stimulus condition relative to a comparison condition and a baseline assessment. An additional aim was to evaluate whether, for the HB group, transliminality improved the prediction of post-test ASA scores, after controlling for baseline ASA scores. Given the long-standing primary assumption that HB induces an ASC (e.g., Grof & Grof, 2010) we hypothesized on the basis of Tart's (1975) and Singer's (1977) conceptions of an ASC, respectively, that:

1. The HB group will report a different pattern of relationships among phenomenological subsystems than the comparison group and baseline.
2. The HB group will report higher ASA scores than participants in the comparison group, while controlling for baseline ASA scores.

In addition, we hypothesized that:

3. For the HB group, transliminality improves the prediction of post-test ASA scores after controlling for baseline ASA scores.

METHOD

Participants

The present study consisted of a sample of 32 participants [nine male (28.1%), 23 female (71.9%)]. The minimum age requirement for the study was 18 years (consenting age). Ages ranged from 31 to 60 years ($M = 43.19$, $SD = 9.05$, median = 44.5). The 25th percentile was aged 35 and the 75th percentile was aged 49. Sixty percent of participants had prior experience of HB. Three participants (9.4%) conceptualized themselves as “religious,” whereas 27 participants (84.4%) conceptualized themselves as “spiritual.” A Confidential Medical Information Form for Holotropic Breathwork™ Workshops was used to screen participants for contraindicators of HB (i.e., pregnancy, cardiovascular problems, severe hypertension, severe mental illness, recent surgery or fractures, acute infectious diseases, epilepsy).

The principal investigator and co-investigators were affiliated with the Phoenix Institute of Australia at the time this study was conducted. This institution did not have an IRB or require IRB approval. Participants were recruited through word-of-mouth, general electronic advertising mail out, and web posts on various sites such as Misso Psychology, east Melbourne Psychology and Melbourne Breathwork.

This study was introduced to prospective participants as research concerning the subjective effects of HB. No hypotheses were provided to prospective participants, because we did not wish to prime responses. Thus, prospective participants were not informed that the researchers were expecting participation in HB to be associated with an ASC. Prospective participants were advised that participation in the present study was voluntary and that they were free to withdraw from the study at any time. Prospective participants read a Plain Language Statement and, if they agreed to participate in the present study, signed a Consent Form.

Design

The present study consisted of a repeated-measures design whereby participants' phenomenology was assessed at baseline using the PCI at an initial time, t_1 . Subsequently, participants were exposed to counterbalanced sequences of a treatment condition (i.e., a HB procedure) and a comparison condition and phenomenology was assessed after each condition. These conditions are described below in the **Procedure** subsection.

Materials and Apparatus

Instrument: Transliminality Scale Revised (Form B). This scale consists of 29 true/false items, of which 17 are scored for the psychometrically improved Rasch-scaled version, after top-down purification using Rasch-scaling techniques to eliminate age and gender bias from the scale.⁴ Rasch-scaling alters the scoring range and mean. Raw range is 0 to 29; Raw mean = 14.5. The KR-20 reliability coefficient of the scale is 0.85 (Lange, Thalbourne, Houran, & Storm, 2000). In the present study, a reliability test of the Rasch-scaled Transliminality Scale (RTS) yielded a Cronbach's alpha of .62.

Phenomenology of Consciousness Inventory (PCI). The PCI (Pekala, 1991) is a 53-item scale used to assess the phenomenological effects of different stimulus conditions (e.g., hypnosis, meditation). The PCI contains 26 (sub) dimensions including 12 major dimensions (e.g., Positive Affect, Negative Affect, Altered Experience), and 14 minor dimensions (e.g., Joy, Anger, Altered Body Image) (Pekala, 1985). Participants are asked to respond to each item on a 7-point Likert scale (Pekala & Wenger, 1983). The PCI has respectable psychometric properties (e.g., Pekala, 1991). For example, the PCI has been shown to reliably discriminate between qualitatively different states of consciousness (thus supporting the scale's criterion validity), and has demonstrated good internal consistency, yielding coefficient alphas between .70 and .90 (Pekala, Steinberg, & Kumar, 1986). In the present study, the Cronbach's alpha for the PCI was .77 for baseline, .86 for the HB group, and .92 for the comparison group.

Materials. Each participant formed part of a dyad and was provided with a mattress, fitted sheet, blanket, towel, eyeshades, pillow, tissues and rubbish bag. Each HB session included a set of musical pieces lasting two hours and 40 minutes. The musical pieces were divided into three sections of approximately

equal length: (a) rhythmic drumming, (b) expansive, symphonic style pieces, and (c) relaxing and peaceful music. A musical system was used consisting of two large commercial speakers, a base speaker, amplifier, mixer and CD player.

Procedure

The sessions were conducted in a group context across two weekend residential retreats and conformed to Grof Holotropic Breathwork™ protocols. There are five distinct stages to a HB workshop session: (a) screening (see **Participants** subsection), (b) preparation, (c) the session, (d) focused bodywork, and (e) integration (Grof & Grof, 2010).

1. Preparation for the HB session involved the development of comfort and trust within the group. Participants were randomly matched in dyads and each member of the dyad was randomly assigned to the treatment (HB) group or a comparison ('sitter') group and administered the PCI for the baseline assessment.
2. The sessions were overseen by four facilitators, of which three were registered HB facilitators trained in the USA by Stanislav Grof and also registered psychologists. Operating in dyads, the HB participants were instructed to lie down on the mattress and make themselves comfortable. Comparison participants were instructed to sit quietly next to the HB participant and do so with eyes open. The lights in the room were dimmed, and one of the facilitators led the group through a 20-minute progressive muscle relaxation. Subsequently, HB participants were instructed to allow their attention to shift from their thought processes to their breath. HB participants were instructed to breathe deeper and faster in a cyclical manner and, if possible, to continue this process for approximately 40 minutes. Next, the music commenced at a volume high enough to nullify any other sounds (e.g., breathing, talking). The duration of the music was approximately two hours and 40 minutes and divided into three sections of approximately equal length: (a) rhythmic drumming, (b) expansive, symphonic style pieces, and (c) relaxing and peaceful music. During the music, the facilitators supported the dyads and provided body work where required.
3. Towards the end of the music, the facilitators offered focused bodywork, involving gentle pressure or body manipulation, in order to process any latent tension that resided within the HB participant. After the music ended, the facilitators checked-in with each dyad in order to ensure that the HB participant felt that the session was completed. Subsequently, each member of the dyad was instructed to complete the PCI.
4. HB participants were instructed to complete integration activities (i.e., speaking with their comparison participant at length about their HB experience, engaging in free-form art work and, finally, having lunch).
5. After lunch, the HB procedure was repeated for the whole group with the dyads inverting the HB-comparison roles. Subsequently, each member of the dyad was instructed to complete the PCI.

We acknowledge that our comparison group was exposed to components of the holotropic activity (i.e., loud evocative music). However, a breather-sitter dyad is an integral part of the standard Grof HB protocol, and, thus, to remove the sitters and dissolve the dyad would significantly compromise the gestalt of the therapeutic process involved in HB, and, therefore, the ecological validity of the present study. Indeed, when considering the numerous variables involved, the sitters' presence may contribute to the HB participants' response. In order to determine which components of HB contribute to the observed effects it would be necessary to carry out a treatment-component dismantling study. However, we note that established research practice dictates that an overall treatment effect (i.e., response to the overall intervention) should be measured prior to undertaking a dismantling study (Ahn & Wampold, 2001).

STATISTICAL ANALYSIS

We note that the Jenrich (1970) Test is the appropriate statistical procedure to assess pattern differences associated with the 12 major dimensions of the PCI (Pekala, 1991). However, Pekala (1991, p. 235) asserted that the Jenrich Test is a "large-sample multivariate procedure" requiring a minimum of 60 participants per condition (provided that all 12 major dimensions of the PCI are being examined). Given that the present study did not meet this sample size requirement, the Jenrich Test was not appropriate. Consequently, a Box Test comparison was performed (Pekala, 1991) to assess Hypothesis 1 (H1), whereby the independent variable (IV) consisted of three groups or levels (i.e., baseline; HB; comparison) and the dependent variable (DV) was the pattern of phenomenological subsystems (i.e., the covariance matrix consisting of the 12 PCI variables) for each of the three groups. The Box Test yields a Box M statistic that "tests the homogeneity of variance-covariance matrices" (Tabachnick & Fidell, 2007, p. 252). The inflation of the Type 1 error rate due to performing multiple tests was corrected using a Bonferroni adjustment whereby the alpha was divided by the number of tests.

Hypothesis 2 (H2) was addressed using a one-way repeated-measures analysis of covariance (ANCOVA). In this analysis, the repeated-measures factor consisted of two levels (i.e., HB versus comparison), and the DV was post-test ASA scores. The covariate was baseline ASA scores.

Hypothesis 3 (H3) was tested using a hierarchical multiple regression. Baseline ASA scores were entered in block 1. Subsequently, transliminality was entered in block 2 while controlling for baseline ASA scores. The DV was post-test ASA scores.

RESULTS

Descriptive Data

Transliminality. The mean score for the RTS was 27.93 ($SD = 3.17$). The skew of the distribution of scores was normal ($skew = 0.27$, $SE = .41$). The

theoretical range is 13.70 to 37.30, and the observed range was 21.10 to 35.00. Sex was correlated with RTS, $r(32) = .40, p = .023$; however, age was not, $r(32) = -.01, p = .98$.

H1: The HB group will report a different pattern of relationships among phenomenological subsystems than the comparison group and baseline.

After performing a Bonferroni correction for multiple comparisons (adjusted $\alpha = 2/.05 = .025$), a Box Test of the equality of covariance matrices revealed that the difference between the covariation matrices of the HB group versus baseline was statistically significant, $F(78, 10521.79) = 1.49, p = .003$; Box M = 149.27. However, the difference between the HB group and the comparison group was not statistically significant, $F(78, 9527.02) = 1.14, p = .191$; Box M = 115.93. The hypothesis was partially supported. The psygrams for baseline, the HB group, and the comparison group are depicted in Figure 1 to 3.

H2: The HB group will report higher ASA scores than participants in the comparison group, while controlling for baseline ASA scores.

A one-way repeated-measures ANCOVA was performed with group (HB; comparison) as the IV, post-test scores on ASA as the DV, and baseline scores on ASA as the covariate. After controlling for baseline, there was a statistically significant main effect for group, $F(1, 30) = 11.64, p = .002$; partial $\eta^2 = .28$. Thus, group accounts for 28% of the variability in post-test ASA scores. The mean score for the HB group ($M = 3.11, SD = .87$) was statistically significantly higher than the mean score for the comparison group ($M = 2.08, SD = .98$). The hypothesis was supported.

H3: For the HB group, transliminality improves the prediction of post-test ASA scores after controlling for baseline ASA scores.

A hierarchical multiple regression was conducted to examine whether baseline ASA and transliminality were significant predictors of post-test ASA scores. A specific focus of this analysis was to determine whether transliminality statistically significantly improved the prediction of post-test ASA scores after controlling for baseline ASA scores.

At step 1, baseline ASA was a statistically significant predictor of post-test ASA, $R^2 = 0.19$ (Adjusted $R^2 = 0.17$), $F(1, 30) = 7.17, p = .012$. At step 2, the inclusion of transliminality did not statistically significantly improve prediction of post-test ASA, $\Delta R^2 = 0.10, F(1, 29) = 3.92, p = .057$ (see Table 1). However, at both steps, R was statistically significantly different from zero; Step 1 $R = .44, F(1, 30) = 7.17, p = .012$; Step 2, $R = .54, F(2, 29) = 5.90, p = .007$.

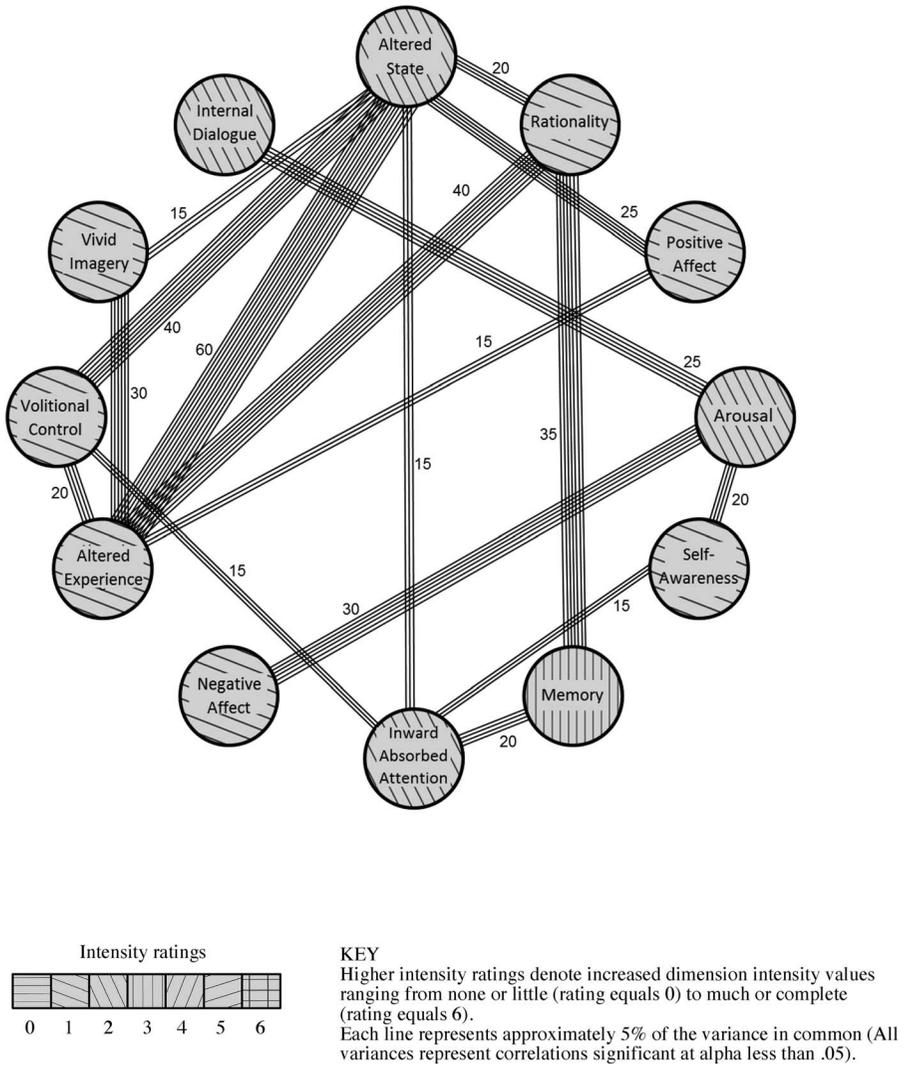


Figure 1. Psygram of baseline.

POST HOC ANALYSIS

For the sake of completeness, we elected to evaluate group differences in intensity ratings across the remaining phenomenological subsystems that the PCI is capable of measuring (Positive Affect, Negative Affect, Altered Experience, Imagery, Attention, Self-Awareness, Internal Dialogue, Rationality, Volitional Control, Memory, and Arousal).

A one-way repeated-measures multivariate analysis of variance (MANOVA) was conducted with group (baseline; HB; comparison) as the IV and the aforementioned phenomenological subsystems as the DVs. We point out that it is more parsimonious to perform multivariate, rather than univariate, analyses

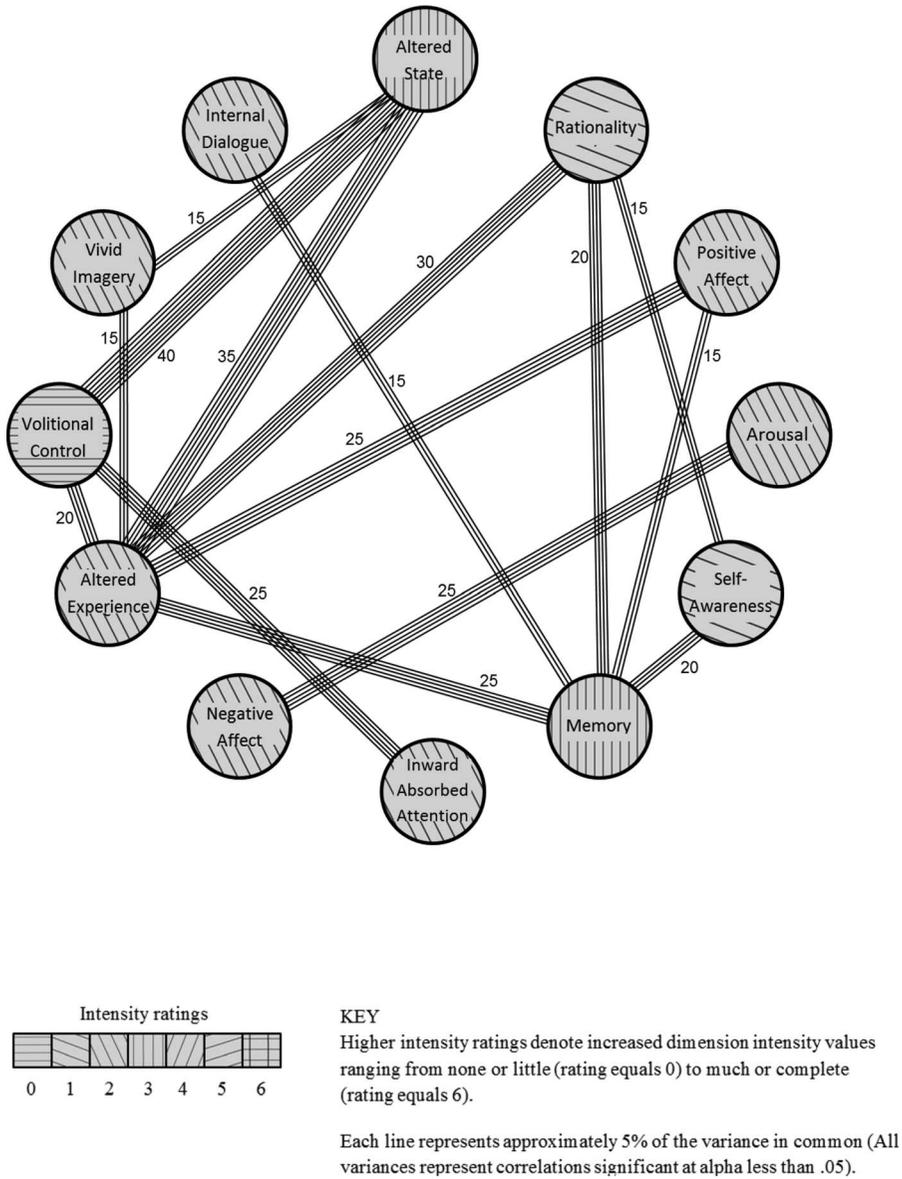
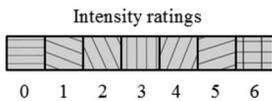
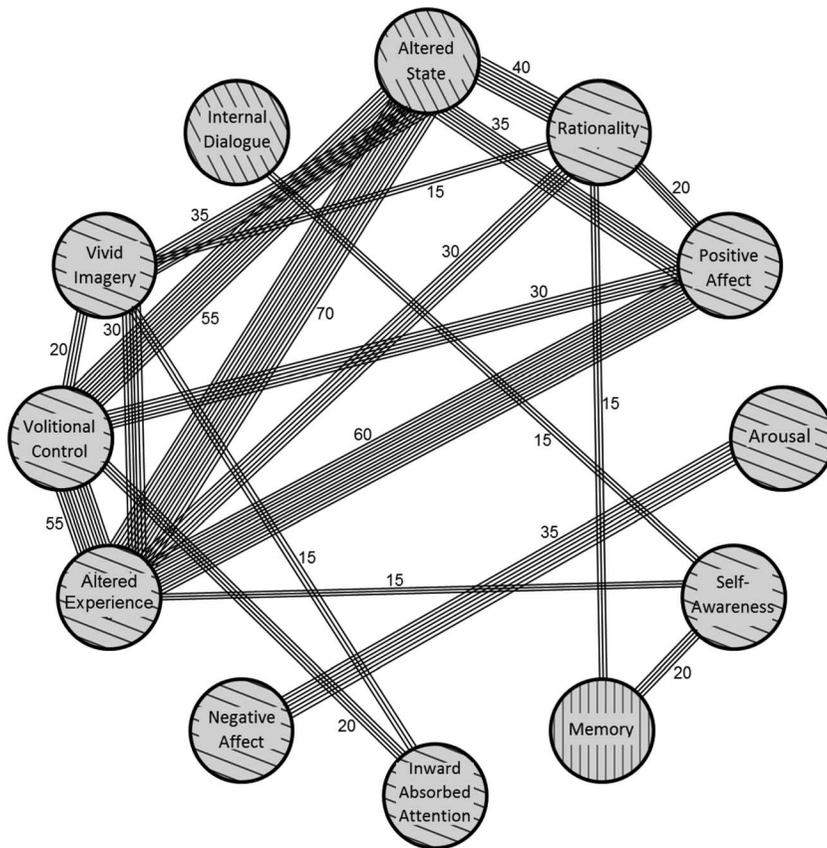


Figure 2. Psygram of HB group.

when one wishes to examine group differences on multiple, related DVs. MANOVA yields a multivariate effect (i.e., an effect on *combined* DVs). If a statistically significant multivariate effect is found, then an examination of the univariate effects (i.e., results concerning each *individual* DV) is warranted (on MANOVA, see Tabachnick & Fidell, 2007).

A statistically significant multivariate effect was found for group, $F(22, 80) = 4.90, p = .000, \text{partial } \eta^2 = .318$. The univariate effects are presented in Table 2.



KEY
Higher intensity ratings denote increased dimension intensity values ranging from none or little (rating equals 0) to much or complete (rating equals 6).

Each line represents approximately 5% of the variance in common (All variances represent correlations significant at alpha less than .05).

Figure 3. Psygram of comparison group.

DISCUSSION

In partial support of H1, there was a statistically significant difference between the psygrams (i.e., covariation matrices) of the HB group versus baseline. This result suggests that, compared to baseline, the HB group was associated with a “major reorganization in pattern structure that is hypothesized by Tart (1975) to be associated with an altered state of consciousness” (Woodside et al., 1997, p. 84). This finding indicates that participants’ cognition in the HB

TABLE 1
Hierarchical Regression Analysis with Transliminality and Baseline ASA as Predictors of Post-Test ASA

	ΔR^2	<i>B</i>	<i>Std error</i>	<i>B</i>	<i>t</i>	<i>sr</i> ²
Step 1	0.19*					
Baseline ASA		0.40	0.15	0.44	2.68*	.19
Step 2	0.10					
Baseline ASA		0.37	0.14	0.40	2.57*	.16
Transliminality		0.09	0.04	0.31	1.98	.10

* $p < .05$; ** $p < .01$; ASA = Altered State of Awareness

group was fundamentally different to participants' cognition at baseline. However, there was not a statistically significant difference between the psygrams of the HB group versus the comparison group. This result may be, at least in part, due to the fact that the comparison group, in accordance with attempts to preserve the external validity of the present study, was exposed to variables such as loud, evocative music.

In support of H2, the HB group reported statistically significantly higher ASA scores relative to the comparison group, while controlling for baseline ASA scores. The ASA dimension quantifies one's experience of "an extraordinarily unusual and nonordinary state of awareness versus one's state of consciousness being no different than usual" (Pekala, 1991, p. 132). As previously stated, in Singer's (1977) view, it is the quantitative shift in the *intensity*, rather than the *pattern*, of phenomenology that constitutes an ASC. Thus, from Singer's perspective, this result supports the long-standing assumption that HB induces non-ordinary or altered SoCs (e.g., Rhinewine & Williams, 2007).

Regarding H3, baseline ASA scores was a statistically significant predictor of post-test ASA scores for the HB group. However, the inclusion of transliminality did not statistically significantly improve the prediction of post-test ASA scores, after controlling for baseline ASA scores. Indeed, baseline ASA scores accounted for 16% of the unique variability in post-test ASA scores, whereas transliminality accounted for 10% of the unique variability in post-test ASA scores. We note that the regression model containing these two predictors was statistically significantly different from zero. In general terms, in the context of HB it seems that one's phenomenology at baseline appears to influence one's post-test phenomenology.

Our post hoc analyses yielded numerous statistically significant group differences regarding PCI dimensions. The HB group reported statistically significantly higher Negative Affect, Altered Experience, and Visual Imagery scores relative to baseline and the comparison group. Negative Affect consists of the minor dimensions Anger, Sadness and Fear. The Anger dimension evaluates feelings of being "angry and upset," whereas Sadness assesses "feeling very, very sad or unhappy." The Fear minor dimension monitors feeling "very frightened" or being "scared or afraid" (Pekala, 1991, p. 131).

TABLE 2
PCI Dimension Differences Between Means of Each Condition

PCI Dimension	1 Baseline <i>M (SD)</i>	2 HB <i>M (SD)</i>	3 Comparison <i>M (SD)</i>	<i>F</i>	<i>p</i> ^a	Partial η^2	Post Hoc
Positive Affect	1.24 (0.49)	1.42 (0.64)	1.38 (0.42)	1.22	.293	.047	
Negative Affect	0.95 (0.55)	1.57 (0.71)	0.93 (0.53)	12.88	.000	.340	1 < 2; 2 > 3
Altered Experience	1.06 (0.35)	1.57 (0.44)	1.32 (0.48)	16.31	.000	.395	1 < 2; 1 < 3; 2 > 3
Visual Imagery	1.25 (0.47)	1.94 (0.78)	1.30 (0.52)	14.15	.000	.361	1 < 2; 2 > 3
Attention	1.67 (0.39)	1.78 (0.37)	1.51 (0.31)	5.22	.009	.173	2 > 3
Self-awareness	1.46 (0.34)	1.42 (0.42)	1.42 (0.29)	0.37	.692	.015	
Internal Dialogue	1.79 (0.72)	1.73 (0.64)	1.73 (0.62)	0.12	.886	.005	
Rationality	1.41 (0.24)	1.06 (0.58)	1.37 (0.38)	6.60	.003	.209	1 > 2; 2 < 3
Volitional Control	0.88 (0.45)	0.33 (0.30)	0.69 (0.39)	24.09	.000	.491	1 > 2; 2 < 3
Memory	2.95 (0.57)	3.00 (0.44)	2.86 (0.61)	0.71	.498	.028	
Arousal	1.58 (0.76)	2.06 (0.82)	1.50 (0.65)	4.90	.011	.164	2 > 3

a. Adjustment for multiple comparisons: Bonferroni.

Altered Experience consists of four minor dimensions: Altered Body Image, Altered Time Sense, Altered Perception, and Altered or Unusual Meaning. Altered Body Image quantifies the degree to which participants “feel their bodily feelings expand into the world around them” (p. 132). Altered Time Sense assesses the extent to which “the flow of time changed drastically” or whether it appeared to “speed up or slow down” (p. 132). Altered Perception evaluates “changes in the perception of the world in terms of color, form, size, shape, or perspective” (p. 132). Altered Meaning assesses the degree to which a participant reports “an experience that might be labeled religious, spiritual, or transcendental, or has feelings of awe, sacredness, or reverence” (p. 132). Visual Imagery consists of the following two minor dimensions: Amount of Imagery (e.g., “My experience was made up almost completely of images”, p. 131) and Vividness of Imagery, which evaluates the degree to which one’s visual imagery is “vivid and three-dimensional” or “as clear and vivid as objects in the real world” (p. 132).

The HB group reported statistically significantly lower Rationality scores relative to baseline and the comparison group. Rationality “addresses whether thinking is clear and distinct, or rational and easy to comprehend, versus thinking being “confused and muddled” or “non-rational and very hard to comprehend” (Pekala, 1991, p. 132).

In addition, the HB group reported statistically significantly higher Attention and Arousal scores relative to the comparison group. Attention is comprised of two minor dimensions: Direction and Absorption. Direction monitors whether attention is focused on “internal subjective experience” or “toward the environment around me” (Pekala, 1991, p. 132). Absorption evaluates whether one is ensconced in what one is experiencing or “continually distracted by extraneous impressions” (p. 132). Arousal measures “the extent of muscular tension, that is, the extent to which the muscles of the body are “very tense and tight” versus not feeling “tension or tightness at all” (p. 132).

Finally, the HB group reported statistically significantly lower Volitional Control compared to baseline and the comparison group. Volitional control evaluates the degree to which participants have “complete control over what one is paying attention to” versus having “images and thoughts pop into my mind without my control” (Pekala, 1991, p. 132).

The PCI was selected for the present study because, “for research purposes it still is probably the most flexible and best documented instrument to evaluate different states of consciousness” (Johanson, Valli, & Revonsuo, 2011, p. 15). Thus, the PCI is perhaps the ideal instrument to assess the primary claim that HB induces an ASC relative to, for example, baseline. However, despite the promising results of the present study, we caution the reader that the PCI is a general measure of phenomenological responses to stimulus conditions and was, therefore, not specifically designed to measure the phenomenology of HB. Thus, there may be phenomenological variables that are integral to HB-induced states that are not measured by the PCI. More specifically, the PCI does not allow one to investigate whether HB induces an ASC that is holotropic. Future research might use the PCI in conjunction with other quantitative measures such as the *APZ-OAV Questionnaire* (Abnormer Psychischer Zustand = altered states of consciousness; Dittrich, von Arx, & Staub, 1985) and qualitative methodologies such as interpretive phenomenological analysis to test: (a) the primary claim that HB induces an ASC, and (b) the secondary claim that HB induces an ASC that may be characterized as holotropic. In addition, for the purpose of item construction one might use a complementary mixed-methods approach whereby semi-structured interviews are administered to HB participants. The resultant qualitative data may be phenomenologically analyzed with the aim of generating comprehensive constituent themes that capture the essential aspects of HB experiences. Such themes may be used to create items comprising a quantitative measure designed specifically to investigate the phenomenological effects of HB.

A difficulty inherent in the investigation of the majority of psychotherapeutic techniques and procedures, including HB, is that they are typically composed of a number of elements that may contribute to a greater or lesser extent to the observed effects of the intervention (Ahn & Wampold, 2001). Therefore, given the scarcity of studies investigating HB, an avenue for future research would be to carry out a dismantling study in which the PCI is used to assess the constituent elements of HB (i.e., rapid, deep breathing; evocative music; focused bodywork) in isolation and in combination. This process would allow one to examine the phenomenological effects of each component of HB and whether each element contributes to the observed phenomenological effects of HB.

It has been suggested that HB may facilitate significant clinical benefits, whereby the HB method allows individuals to access, re-experience and integrate previous trauma and may lead to reductions in death anxiety and increases in self-esteem when included as an adjunct to psychotherapy (Holmes et al., 1996). Given such purported effects it would be of interest to

conduct a controlled investigation of the impact of HB on variables such as general subjective distress, including anxiety and depression, using measures such as the *Depression Anxiety Stress Scales* (Lovibond & Lovibond, 1995) momentary well-being (e.g., *Positive Affect and Negative Affect Schedule-Expanded Form*) (Watson & Clark, 1994), and self-esteem. It would also be of significant interest to measure variables associated with the presence, organization and intrusiveness of traumatic/aversive memories (e.g., using the *Trauma Memory Questionnaire*, Halligan, Clark, & Ehlers, 2002; or the *Intrusive Memory Questionnaire*, Michael & Ehlers, 2007) and the extent to which these variables promote subjective distress. Furthermore, it is recommended that future researchers use the PCI to test whether phenomenological variables *mediate* the relationship between personality traits and clinical outcome variables such as subjective distress and the presence and intrusiveness of traumatic memories. For example, future research might investigate the relationship between transliminality and distress associated with aversive memories in the context of a HB condition and whether the PCI-variable Altered State of Awareness mediates (i.e., contributes to) this relationship. Thus, within the context of HB, one may postulate a hypothetical causal chain whereby an IV (X), transliminality, promotes fluctuations in a mediator (M), Altered State of Awareness, which promotes fluctuations in a DV (Y), distress associated with aversive memories, thus, $X \rightarrow M \rightarrow Y$.

Moreover, the PCI enables researchers to explore whether phenomenology *moderates* the effect of an HB condition on a given clinical outcome variable. That is, whether there is an *interaction* between a HB condition and phenomenological variables with respect to their effect on a given clinical outcome variable. For example, in the context of a HB experiment, it might be hypothesized that the PCI-variable Attention moderates the effect of HB on a clinical outcome variable. A finding in support of this hypothesis would suggest that the effect of HB on the clinical outcome variable is not the same for high and low Attention participants.

Previous research concerning the PCI (e.g., Manmiller, Kumar, & Pekala, 2005; Pekala, Kumar, Maurer, Elliott-Carter, & Moon, 2006; Robin, Kumar, & Pekala, 2005) has been conducted in a Classical Test Theory sense. However, it would be advantageous to investigate whether the findings of the present study are replicated using Modern Test Theory (Rasch scaling), which controls for artifacts pertaining to response biases and generates interval scale data (Lange et al., 2000).

CONCLUSION

The present study was fruitful in terms of identifying phenomenological dimensions that appear to underlie the HB process. First, the HB group reported a statistically significant shift in the pattern structure of phenomenological subsystems relative to baseline. Second, the HB group reported statistically significantly higher Altered State of Awareness scores relative

to the comparison group, while controlling for baseline Altered State of Awareness scores. Finally, our post hoc analysis revealed numerous phenomenological differences (e.g., Negative Affect, Altered Experience, Visual Imagery) between the HB group, the comparison group and baseline. Taken together, the results of the present study highlight the usefulness of applying a process-oriented approach to the study of HB. We caution, however, that statistically significant results that are not replications should be regarded as tentative pending replication, and corrections for multiple analyses do not qualify as a substitute for replication. Thus, we see the next step in this line of enquiry as an attempt to replicate our statistically significant findings while also investigating the unverified assumption that HB induces a holotropic ASC, and testing HB mediation and moderation models focused on pertinent clinical outcome variables.

NOTES

¹ Rock and Krippner (2012) argued that altered states of consciousness are more appropriately referred to as altered states of phenomenology. Also see Beischel, Rock and Krippner (2011) and Rock and Krippner (2007ab, 2011ab).

² Pekala (1991) asserted that

To assure that only statistically significant correlations are represented, I have generally chosen to represent only those variances that denote a significant correlation between dimensions, with an alpha level of no greater than .05 (although I have opted for an alpha value of .01 or .001 depending on the size of the sample and how conservative I want to be). (p. 173)

³ In defense of the use of coefficients of determination rather than correlation coefficients, Pekala (1991) explained that

Psygrams thus illustrate *not* the correlations between dimensions, but rather the *variance in common* between dimensions. It was decided to utilize coefficients of determination instead of correlations so that the reviewer could look at a psygram and tell from the drawing what percentage of variance two PCI dimensions have in common. It was felt that this was a better descriptor of the “pattern” relationships between dimensions than its associated correlation. (p. 173)

⁴ According to Houran and Lange (2012),

“Top-down purification” refers to a set of Rasch scaling procedures that identify and remedy differential item functioning in questionnaires, i.e., response biases related to extraneous variables such as respondents’ ages, genders, or even cultures. These biases can elicit spurious factor structures of test items, as well as erroneous findings from statistical analyses. Rasch scaling also yields measures that have *interval-level* properties. Therefore, the techniques overcome the limitations of classical test theory. (p. 45)

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