Research Internship

# The Clinical Effectiveness of Breathing and Relaxation therapy: Results in Routine Practice


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# The clinical effectiveness of breathing and relaxation therapy: results in routine practice

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## Abstract

**Introduction** - The present study investigated the effect of breathing and relaxation therapy (BRT) in clinical practice using Jacobson's analysis of clinical significance. The purpose is to establish the proportion of patients who improve and those who improve enough to be classified as recovered. **Methods** - This study took place in a primary care practice offering BRT to patients with a wide range of complaints. A total of 146 patients were included who completed the Nijmegen Questionnaire (Doorn, Colla & Folgering, 1983) to measure the results of the therapy. **Results** – Most frequently occurring complaints were stress, hyperventilation, inadequate sleeping and anxiety-related problems. The analysis of clinical significance showed that 70% of the patients reliably improved and 60% improved enough to be recovered. The proportions improved and recovered were significantly different between groups. Patients with hyperventilation complaints had higher improvement and recovery rates compared to patients with sleeping and anxiety-related problems. **Conclusion** – BRT seems to be an effective treatment for complaints that are the consequences of excess tension. Treatment was most effective for patients with hyperventilation complaints.

## Introduction

### *Stress*

Stress is the condition that results when person-environment transactions lead the individual to perceive a discrepancy, whether real or not, between the demands of a situation and the resources of the person's biological, psychological or social systems. Stress is a normal phenomenon and is needed to function well. Persistent stress that is not resolved through coping or adaptation, may however impede functioning and can lead to physical complaints. Every individual needs relaxation to be able to function on an adequate level of stress. If the stress level is increased for a longer period, the danger exists that this level is considered to be the normal level of stress. The body gets used to this increased level of stress and muscles are tightened continuously more than necessary. More energy is spent for the same tasks and complaints of neck, back and shoulder may be the effect of this excess muscle tension. More efforts result in less gain which leads to fatigue. The increased level of stress and fatigue leads to faster and shallower breathing, even if the body does not need this amount of oxygen. This excessive breathing takes more energy and leads to breath-related complaints: (chronic) hyperventilation, dyspnea, tingling fingers, breathlessness, etc. At the same time there is no cognitive rest, demonstrated by problems in attention and concentration.

Breathing and relaxation therapy (BRT), developed by J.J. van Dixhoorn (Van Dixhoorn, 1998), is a method to improve management of stress and to improve or even solve the negative consequences of an increased level of stress. These consequences can vary and are of a somatic, affective or psychological nature. In this pragmatic study data from routine clinical practice are used to evaluate the effect of breathing and relaxation therapy.

*Relaxation*

Many studies over the last 25 years have shown that relaxation interventions are more effective than no treatment or placebo control in the treatment of health problems, such as headaches, insomnia, back pain and anxiety disorders, that are caused or deepened by stress (Conrad & Roth, 2007; Jacobs, 2001). The founder of scientific relaxation, Edmund Jacobson, developed the method of progressive muscle relaxation (PMR). Throughout time many abbreviated methods of PMR have been developed. Jacobson's original PMR included in its training procedure first tensing a muscle and then releasing that tension. The basic therapeutic claim of muscle relaxation is that people can find relief from their distress and its physiological accompaniments by learning to reduce muscle tension.

Lichstein, Wilson and Johnson (2000) showed a strong response to a relaxation and stimulus control intervention in patients with insomnia. Grawe, Donati and Bernauer (2001) evaluated the clinical effectiveness of PMR for different symptoms, primarily hypertension, headaches, and insomnia. Significant positive changes were found in 76% of the studies. Patients with a primary diagnosis of anxiety disorder improved significantly in 8 of 10 studies. Based on more than 60 clinical outcome studies, Jorm et al. (2004) concluded that relaxation was as effective as pharmacotherapeutic, cognitive, or exposure-based interventions for panic disorder (PD) and generalized anxiety disorder (GAD). However, Siev and Chambless (2007) concluded from their meta-analysis that relaxation is as effective as cognitive therapy for GAD, but less effective for PD.

*Breathing*

Breathing instructions are commonly given to individuals with stress and tension and to patients with anxiety disorders. Modifying breathing patterns is to counteract the fast, deep and irregular breathing of stressed or anxious individuals (Conrad et al., 2007). The rationale of breathing training for anxiety patients has often been based on a hyperventilation theory of anxiety. Hyperventilation is responsible for the symptoms of anxiety while, at the same time, it is also one of its manifestations. Therefore, increase of $CO_2$ counteracts anxiety and its inhalation can be used to eliminate or reduce symptoms of anxiety (Chóliz, 1995). According to Meuret et al. (2003) studies of breathing training do not allow an equivocal

judgment of whether such techniques are beneficial, while Conrad et al. (2007) concluded that giving simple and short breathing instructions to PD patients and tense patients does not change levels of emotional activation either in terms of self-report or physiological measures.

There are few studies about breathing training for patients with insomnia. Chóliz (1995) described a technique of breathing that is useful for patients with insomnia, based on the consideration that increase of $CO_2$ concentration, hypercapnia, produces sedative effects. He reported tremendous results, an effect size of no less than 8. However, according to Van den Hout and Kroeze (1995), this is an untenable rationale because increases in $CO_2$ are anxiogenic instead of sedative and independent replications are needed to evaluate breathing training for these patients.

*Combination of breathing and relaxation*

Kraft and Hoogduin (1984) demonstrated breathing and relaxation therapy as an effective treatment for the hyperventilation syndrome. Jain et al. (2007) found a large effect size (Cohen's *d* 0.91) on distress in a one-month somatic relaxation training consisting of autogenic relaxation, progressive muscle relaxation, simple breathing techniques and guided imagery.

Breathing and relaxation therapy (BRT) as favored by Van Dixhoorn (1998) is a method which helps the individual to improve his/her stress management. It does not focus on the complaints the patients have, but on a patient's increased stress level which is often the cause of those complaints (AOS, 2007). The primary task of BRT is to assess the stress level, independent of the influence of external stressors, and to determine whether reducing this stress level will help to diminish symptoms. If symptoms are caused by excess tension they can improve or even be solved by BRT (van Dixhoorn, 2001). If the tension is caused by external stressors one might expect that relaxation will not help as long as these stressors exist. These stressors can be social, psychological or somatic and are called 'limiting conditions' (van Dixhoorn, 2001).

The aim of the present study is to analyze the effect of BRT in patients from a routine clinical practice. There is increasing interest whether the efficacy of treatments in a research setting can be translated into effectiveness in ordinary clinical practice (Westbrook & Kirk, 2005). Patients, therapists and therapies may all differ between clinical practice and research trials. This raises questions about generalizability of treatments from research to clinical practice. Therefore, in the present research the approach is from a clinical perspective.

There are a number of strategies which can be used to look at clinical effectiveness, including Jacobson's analysis of clinical significance. Jacobson, Follette and Revenstorf (1984) argued that applying statistical significance tests to psychotherapy research has little to do with the practical importance of the effect. Statistical comparisons provide no information on the effects of therapy for *individual* patients in a sample and these statistical tests themselves impose a criterion for determining a treatment effect which often has little clinical relevance. The proportion of patients who benefit from a treatment is of great importance to anyone who is interested in the likelihood that a given individual will benefit from therapy. Instead of statistical significance this study uses "clinical significance" as a primary criterion for evaluating breath and relaxation therapy. There is a twofold criterion for significant clinical change: 1. The magnitude of change on a particular measure has to be statistically reliable, that is, beyond the scope of what could reasonably be attributed to chance or measurement error, and 2. this change has to take the patient from a dysfunctional level of functioning to a functional level of functioning (Jacobson et al., 1999).

The aim of the present study is to establish the clinical effectiveness of BRT for a sample treated in routine practice.

## Method

*Participants*

This research took place in a first line practice for breathing and relaxation therapy. This practice offers BRT to patients with a wide range of problems. For about six years it has been a policy to collect outcome data routinely. The dataset for this study contained records for all those patients aged 18-65 referred between October 2002 and August 2008 who completed a course of treatment and for whom the same outcome instrument (Nijmegen Questionnaire) was administered. Patients were referred by a general practitioner, psychologist, other therapist or came on their own initiative. The dataset contained a total of 146 patients. Another 16 patients dropped out before the end of treatment (drop-out rate: 8.9 %), 18 patients were not between the age of 18-65 and from 4 patients no End score was available.

From each patient the main complaint as mentioned by the patient was listed by the therapist. After obtaining demographic and health information, such as age, occupation and reasons for referral, two computer-assisted questionnaires were administered. At the end of treatment patients gave a subjective rating to the effect of treatment on their main complaint.

*Outcome Measure*

The Nijmegen Questionnaire (NQ; see appendix*)* was originally developed as a symptom checklist to identify persons with the hyperventilation syndrome. The NQ is a 16-item scale, and responses on each item were measured on a five-point Likert-type scale ranging from "never" to "very often". Examples of these items are: "Stiffness in fingers or arms" and "Dizziness". A higher score indicates more complaints (van Dixhoorn, 2008a; van Dixhoorn & Duivenvoorden, 1985). According to Doorn, Colla and Folgering (1983) the test-retest reliability of the NQ is adequate ($r = 0.87$; $p < 0.01$). For the healthy population the mean score is 11 (SD 7.6; van Dixhoorn, 2008a).

*Intervention*

Van Dixhoorn developed a method of breathing and relaxation (BRT), including a repertoire of approximately 50 instructions using movement, attention and breathing, as well as manual techniques (touch), feedback and talking about patient's experiences (van Dixhoorn, 1998, 2001, 2008b). The therapist does not follow a prescribed protocol but follows the responses of the patient. Central to the therapy is to start useful processes to promote self regulation of tension. Therapy starts with a trial period of 4-5 sessions, and is prolonged if necessary according to the therapist. Treatment completion is indicated if the therapist concludes that no further treatment is indicated.

*Analysis of clinical significance*

Jacobson's analysis of clinical significance (Jacobson, Follette & Revenstorf, 1984; Jacobson & Truax, 1991; Jacobson et al., 1999) provides information about the effects of therapy for the individual patient. For this purpose a reliable change index and a normal cut-off criterion are calculated to establish significant change and recovery.

A reliable change index (RCI) is calculated to determine if a person's score on the NQ is changed sufficiently for it to be unlikely to be due to chance. When this criteria is met, the patient may be described as reliably improved (or deteriorated) on the measure.

To determine if this change has taken this patient across a cut-off point into the normal range for this measure a normal cut-off criterion is set. When a patient's score is in the normal range for this measure we may consider the person not just improved but also 'recovered' (Jacobson & Truax, 1991; Westbrook & Kirk, 2005). Jacobson and colleagues have set out three possible ways to calculate this cut-off criterion. The choice between the appropriate calculation is determined by the availability of data of the normal population. In the present study, their cut-off criterion 'c' was used, which is a point between the normal population and the dysfunctional population corrected for the pooled standard deviation.

*Effect size*

As another measure of change, uncontrolled effect sizes were calculated. This means that the effect sizes are not compared to a placebo or control group. The pretest-posttest effects were computed using the following formula: $(mean_{start} – mean_{end})/sd_{pooled}$. It provides a crude benchmark for comparison with other studies. According to Cohen's standards, ES values above 0.2 are considered 'small', above 0.5 as 'medium' and above 0.8 as 'large' (Cohen, 1988).

## Results

*General characteristics of the patients*

Table 1 shows the descriptive statistics of the sample. Complaints most occurring were problems with tension, hyperventilation, sleeping problems and anxiety, panic and phobia. On average, patients needed 7 sessions, more than one third received also other somatic or psychosocial treatment.

**Table 1 Patient characteristics (N = 146)**

| *Characteristic* | |
|---|---|
| Age at referral (m, sd) | 38.3 (11.6) |
| Female (%) | 69.9 |
| Referral (%) | |
| • Private initiative | 15.8 |
| • General practitioner | 54.8 |
| • Psychologist | 19.9 |
| • Therapist | 6.8 |
| • Other | 2.7 |
| Complaints (N, %) | |
| • Problems with tension | 47 (32.2) |
| • Hyperventilation | 33 (22.6) |
| • Sleeping problems | 16 (11.0) |
| • Anxiety, panic and phobia | 17 (11.6) |
| • Other | 33 (22.6) |
| Employment (%) | 82.9 |
| - full employment | 63.0 |
| Mean number of sessions (m, sd) | 6.7 (2.2) |
| Other treatment (%) | 39.7 |
| • Somatic | 19.2 |
| • Psychosocial | 16.4 |
| • Both | 4.1 |

*Analysis of clinical significance*

A reliable change index was calculated to determine if patients were reliably improved (or deteriorated) on the measure. The following formula, using data from this study (table 2), was used for the calculation of the RCI (Jacobson & Truax, 1991):

$RCI = Z * S_{diff}$

$S_{diff} = \sqrt{(2 * (S_E)^2)}$

$S_E = s_1 * \sqrt{(1 - r)}$

$S_E = 9.88 * \sqrt{(1 - 0.87)} = 3.56$

$S_{diff} = \sqrt{(2 * (3.56)^2)} = 5.04$

$RCI = 1.96 * 5.04 = 9.87 \approx 10$

**Table 2 Data from this study used to asses RCI and Cut-off criterion**

| Symbol | Definition | Value |
|---|---|---|
| $M_0$ | Mean score of normal population | 11 |
| $M_1$ | Mean score at pre-treatment | 23.22 |
| $M_2$ | Mean score at post-treatment | 11.5 |
| $s_0$ | Standard deviation for normal population | 7.6 |
| $s_1$ | Standard deviation at pretreatment | 9.88 |
| r | Test-retest reliability | 0.87* |
| Z | Z-score 95% confidence interval | 1.96 |

**According to Doorn, Colla & Folgering (1983)

Change scores of 10 points or more on the NQ were needed for patients to be classified as reliably improved or deteriorated.

To calculate the cut-off point between the dysfunctional and the functional population, the mean score on the NQ from the normal population (11 ± 7.6) was used (van Dixhoorn, 2008a). The next formula calculates the cut-off criterion 'c' (Jacobson & Truax, 1991):

$c = ((s_0 * M_1) + (s_1 * M_0)) / (s_0 + s_1)$

$c = ((7.6 * 23.22) + (9.88 * 11)) / (7.6 + 9.88) = 16.31 \approx 17$

This means that a patient needed a post-treatment score <17 in order to be classified as recovered. Furthermore, in order to state that a change had occurred, a change of at least 10 points on the NQ was needed. Clinical significance analyses were carried out only on those patients whose pretreatment score on the NQ was above the cut-off criterion (17 points or more on the NQ). Otherwise it is impossible to define patients as recovered, and very difficult to show reliable improvement (at least 10 points) given the criteria. Although the cut-off criterion was based on the mean of all patients, the mean pre-treatment scores differed between the problem categories (table 3). Patients with hyperventilation had a considerably higher mean score than most other groups of patients. For this group a

**Table 3 Mean scores, effect sizes and clinical significance on Nijmegen questionnaire**

| | All patients | | | | | | Patients with NQ ≥ 17 (or 23) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Start | | | End | | ES | | | Start | | End | | ES | Clinically significant change | | |
| | N | Mean | SD | Mean | SD | | Cut-Off criterion | N (% of all patients) | Mean | SD | Mean | SD | | Reliably improved (%) | Recovered (%) | Reliably deteriorated (%) |
| Problems with tension | 47 | 21.13 | 9.41 | 11.28 | 7.83 | 1.14 | 17 | 31 (66) | 25.94 | 7.54 | 12.32 | 7.97 | 1.76 | 67.7 | 58.1 | 0.0 |
| Hyperventilation | 33 | 28.79 | 7.57 | 11.06 | 7.75 | 2.31 | 17 | 32 (97) | 29.31 | 7.06 | 11.34 | 7.70 | 2.43 | 87.5 | 81.3 | 3.1 |
| Hyperventilation | | | | | | | 23 | 27 (82) | 31.15 | 6.04 | 12.48 | 7.87 | 2.66 | 85.2 | 77.8 | 3.7 |
| Sleeping problems | 16 | 17.19 | 11.46 | 10.38 | 7.10 | 0.71 | 17 | 7 (44) | 28.14 | 6.49 | 15.57 | 7.23 | 1.83 | 57.1 | 28.6 | 0.0 |
| Anxiety Panic and Phobia | 17 | 25.00 | 8.94 | 13.88 | 5.02 | 1.53 | 17 | 15 (88) | 27.13 | 6.97 | 14.40 | 4.91 | 2.11 | 46.7 | 33.3 | 0.0 |
| Other problems | 33 | 22.64 | 9.88 | 11.76 | 5.67 | 1.35 | 17 | 21 (64) | 28.05 | 8.02 | 13.71 | 5.68 | 2.06 | 71.4 | 61.9 | 0.0 |
| All patients | 146 | 23.22 | 9.88 | 11.54 | 6.98 | 1.37 | 17 | 106 (73) | 27.69 | 7.34 | 12.81 | 7.06 | 2.07 | 70.8 | 60.4 | 0.9 |

separate cut-off criterion of 23 is known in the literature (van Dixhoorn, 2008a; Thomas et al., 2005). Therefore, calculations for hyperventilation were also performed with this criterion.

Table 3 shows the improvement on the NQ for the groups of patients. Irrespective of the cut-off criterion, patients started treatment with an average score of 23.2 (sd = ± 9.9) on the NQ. Between groups of patients there was a significant difference in pre-treatment scores ($F = 7.39$, $p < 0.05$). Patients with hyperventilation scored highest (m=28.8), patients with sleeping problems scored lowest (m=17.2) on the measure at pre-treatment. The post-treatment scores on the NQ differed less between patient groups than the scores at pre-treatment ($F = 0.77$ $p > 0.05$). On average patients scored 11.5 ± 7.0 points. This is very close to the score of the normal population (11 ± 7.6). For patients above the cut-off criterion the mean pre-treatment and post-treatment scores were higher (resp. 27.7 ± 7.3 and 12.8 ± 7.1).

The analysis of clinical significance showed that 70% of the patients with a score above the cut-off criterion at pretreatment reliably improved (table 3). From this reliably improved group more than 85% were also classified as recovered, resulting in recovery rates of 60% for this sample. One patient reliably deteriorated.

Chi-square calculations were performed to examine whether reliable improvement rates differed across the four main groups of patients. The proportions improved were significantly different between problems ($\chi^2[3] = 9.27$, $p < 0,05$). Patients with hyperventilation had high improvement rates on the NQ, while anxiety, panic and phobia seem to improve less on this measure. For hyperventilation the outcome was not significantly different when a cut-off criterion of >23 was used. The recovery rates also differed between patient categories ($\chi^2[3] = 13.40$ $p < 0.05$). Patients with hyperventilation had significant higher recovery rates compared to patients with sleeping problems and anxiety, panic and phobia.

*Effect sizes*

Table 3 shows the effect sizes on the NQ. Overall, this ES was 1.4; for all patients starting treatment above the cut-off criterion (73% of all patients), ES was 2.1. ESs were consistently higher in the hyperventilation group (respectively 2.3 for all patients and 2.4 for those starting above the cut-off criterion). ES was even higher when a cut-off criterion of 23 was used (2.7). Lowest ESs were found in the groups of patients with sleeping problems and tension (respectively 0.6 and 1.3; 1.1 and 1.8).

*Effects of initial severity*

The outcome of treatment may depend on the patient's initial level of severity (Speer, 1994). In principle, improvement rates are greater in patients whose scores are higher at the start of treatment. In the present study, pre-treatment scores correlated strongly with change scores between Start and End ($r = 0.60$, $p < 0.05$). The proportions reliably improved differed significantly across the pre-treatment scores ($\chi^2[4] = 44.2$, $p < 0.05$). The proportion 'improved' increased consistently with higher pre-treatment score (table 4). The proportion 'recovered' does not show this trend, most likely because as scores were higher, larger change scores were also needed to reach the cut-off value. The maximum chance of recovery in this sample was for people with pre-treatment scores in the 29–34 range.

**Table 4 Clinical change related to Start score (N=146)***

| Range of Start score | N (% of sample) | Reliably improved (%) | Recovered (%) | Reliably deteriorated |
|---|---|---|---|---|
| 0 – 10 | 13 (8.9) | - | - | 0/13 |
| 11 – 16 | 27 (18.5) | 4 14.8 | - | 1/27 |
| 17 – 22 | 32 (21.9) | 16 50.0 | 16 50.0 | 0/32 |
| 23 – 28 | 27 (18.5) | 16 59.3 | 16 59.3 | 1/27 |
| 29 – 34 | 32 (21.9) | 28 87.5 | 22 68.8 | 0/32 |
| > 35 | 15 (10.3) | 15 100.0 | 10 66.7 | 0/15 |

***RCI = 10, Cut-off criterion = 17**

*Effects of age, gender, length of treatment and concurrent treatment*

Other factors that may influence the outcome of the therapy are age, sex, length of treatment and concurrent treatment.

*Age*. With respect to age, there were significant differences in recovery rates ($\chi^2[2] = 6.77$, $p < 0.05$), when using the age groups of 18 to 25 years, 26 to 45 years and 46 to 65 years. Patients in the age of 18 to 25 had lower recovery rates compared to older patients (table 6).

*Gender*. No significant differences between patient improvement and recovery rates were found between male and female patients ($\chi^2[1] = 0.29$, $p > 0.05$ and $\chi^2[1] = 0.60$, $p > 0.05$).

*Length of treatment*. Patients were divided in three groups, based on the number of sessions they had received. No significant difference in improvement and recovery rates were found between patients who differed in length of treatment (resp. $\chi^2[2] = 1.20$, $p > 0.05$ and $\chi^2[2] = 0.89$, $p > 0.05$). Length of treatment did not depend on the severity of their complaints, the pre-treatment scores did not correlate significantly with the number of sessions ($r = 0.06$, $p > 0.05$).

*Concurrent treatment.* No significant differences in improvement and recovery rates were found between patients who had other somatic and/or psychosocial treatment and patients who had no other treatment besides BRT (resp. $\chi^2[3] = 3.71$ and $p > 0.05$, $\chi^2[3] = 6.35$, $p > 0.05$).

**Table 6 Clinical change by age**

| Age | N (% of sample*) | Mean score at Start (SD) | Reliably improved (%) | Recovered (%) | No reliable change/ deteriorated |
|---|---|---|---|---|---|
| 18 – 25 | 20 (18.9) | 27.75 (6.93) | 50.0 | 35.0 | 0/20 |
| 26 – 45 | 60 (56.6) | 28.00 (7.66) | 75.0 | 65.0 | 0/60 |
| 46 – 65 | 26 (24.5) | 27.16 (7.10) | 76.9 | 69.2 | 1/25 |

***In this analysis only patients with a score ≥ 17 are included (N=106)**

*Limiting conditions*

For every patient the role of limiting conditions had been assessed (table 7). Almost 25% of the patients had limiting conditions which impeded treatment (category 2-3). The presence of limiting conditions did not influence the length of treatment. Table 8 shows that the presence of limiting conditions had a notable influence on the outcome of treatment ($\chi^2[3] = 36.80$, $p < 0.05$). Only six patients from the categories 2 and 3 improved and only one patient recovered. Patients with sleeping problems and, to a lesser extent, patients with anxiety, panic and phobia had relatively more limiting conditions (table 9).

**Table 7 Limiting conditions**

| Categories | | Frequency (%) ≥ 17 | Mean nr of sessions |
|---|---|---|---|
| 0 | Limiting factors were not present or appeared to be irrelevant for the success of breathing therapy | 59 (55.7) | 6.4 |
| 1 | Limiting factors were present, but were amenable to change during the treatment | 22 (20.8) | 7.4 |
| 2 | Limiting factors were present and blocked success of breathing therapy | 21 (19.8) | 7.1 |
| 3 | Other factors appeared during treatment which gave rise to new complaints and dominated the complaints for which treatment was started | 4 (3.8) | 6.0 |

**Table 8 Clinical change by limiting conditions**

| Limiting conditions | N (% of sample) | Mean Score at Start (SD) | Reliably improved (%) | Recovered (%) | Reliably deteriorated |
|---|---|---|---|---|---|
| 0 | 59 | 27.8 (7.4) | 52 (88.1) | 48 (81.4) | 0/71 |
| 1 | 22 | 26.6 (6.9) | 17 (77.3) | 15 (68.2) | 0/22 |
| 2 | 21 | 27.0 (8.4) | 6 (28.6) | 1 (4.8) | 1/21 |
| 3 | 4 | 25.5 (4.2) | 0 (0.0) | 0 (0.0) | 0/5 |

***In this analysis only patients with a score ≥ 17 are included (N=106)**

**Table 9 Limiting conditions by problem category**

| Problem category | N | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|
| Problems with tension | 31 | 20 | 4 | 7 | - |
| Hyperventilation | 32 | 22 | 6 | 3 | 1 |
| Sleeping problems | 7 | 2 | 1 | 3 | 1 |
| Anxiety, panic and phobia | 15 | 8 | 2 | 4 | 1 |
| Other problems | 21 | 7 | 9 | 4 | 1 |
| All patients | 106 | 59 | 22 | 21 | 4 |

***In this analysis only patients with a score ≥ 17 are included (N=106)**

*Effect of treatment according to the patient*

At the end of treatment every patient gave a subjective rating for the effect of treatment on their main complaint (table 10). When the patient denoted he/she had no effect from treatment, the therapist determined if this effect was labeled as 'not relevant' or 'no response'. Not relevant means that the patient did respond well to therapy, but the complaints were not caused by tension and did not diminish. No response means that the patient was not motivated for therapy. From all patients, 73% reported a good effect. A score of 1 (good effect) corresponded with high improvement and recovery rates on the NQ (table 11; $\chi^2[3] = 31.28$, $p < 0.05$). Relatively few patients with sleeping problems rated the effect of treatment as good (table 12).

**Table 10 Effect of treatment according to the patient**

| Effect of treatment according to the patient | | Frequency (%) ≥ 17 | Mean nr of sessions |
|---|---|---|---|
| 1 | Good | 77 (72.6) | 6.6 |
| 2 | Limited | 24 (22.6) | 7.4 |
| 3 | Not relevant | 1 (0.9) | 7.0 |
| 4 | No response | 4 (3.8) | 4.5 |

**Table 11 Clinical change by subjective judgment of the patient**

| Effect of treatment | N (% of sample) | Mean Score at Start (SD) | Reliably improved (%) | Recovered (%) | Reliably deteriorated |
|---|---|---|---|---|---|
| Good | 77 (72.6) | 27.8 | 65 (84.4) | 59 (76.6) | 0/77 |
| Limited | 24 (22.6) | 27.8 | 9 (37.5) | 4 (16.7) | 0/24 |
| Not relevant | 1 (0.9) | 31.0 | 0 (0.0) | 0 (0.0) | 0/1 |
| No response | 4 (3.8) | 23.8 | 1 (25.0) | 1 (25.0) | 1/4 |

***In this analysis only patients with a score ≥ 17 are included (N=106)**

**Table 12 Effect of treatment by problem category**

| Problem category | N | good | limited | not relevant | no response |
|---|---|---|---|---|---|
| Problems with tension | 31 | 24 | 7 | - | - |
| Hyperventilation | 32 | 27 | 4 | - | 1 |
| Sleeping problems | 7 | 2 | 4 | 1 | - |
| Anxiety, panic and phobia | 15 | 10 | 3 | - | 2 |
| Other problems | 21 | 14 | 6 | - | 1 |
| All patients | 106 | 77 | 24 | 1 | 4 |

***In this analysis only patients with a score ≥ 17 are included (N=119)**

## Conclusion and Discussion

The present study was meant to investigate the effects of BRT in routine clinical practice. The results provided evidence that BRT is an effective treatment for patients with complaints that are the consequences of excess tension.

When all patients were included, the pre-treatment - post-treatment effect size was 1.4. For patients who started treatment above the normal range cut-off this effect size was 2.1. The effect sizes are large, but it is not known how changes relate to spontaneous change or change due to other treatments. Of patients who started treatment above the cut-off criterion (17 points on the Nijmegen Questionnaire [NQ]), 70% showed reliable improvement (of 10 or more points on the NQ), while more than 60% recovered.

The effect of treatment differed between the groups of patients. This is in contrast with Van Dixhoorn and Hoefman (1987), who found BRT to be equally effective for patients with hyperventilation and patients without hyperventilation. However, they employed a different cut-off criterion (20 on the NQ). In the present study patients with hyperventilation and problems with tension had relatively high improvement rates (respectively 87.5% and 67.7%). Patients with sleeping problems and anxiety, panic and phobia had the lowest improvement rates (respectively 57.1% and 46.7%).

There are some possible explanations for the different outcomes per problem group. First, the number of patients included in this study, particularly the number of patients with sleeping problems, is limited. For this reason the outcome for the smallest patient groups may be unreliable.

A second explanation could be the significant difference in initial severity between groups. Patients with hyperventilation and anxiety, panic and phobia had relatively high pre-treatment scores compared to patients with sleeping problems, which is also known from

other studies (van Dixhoorn & Hoefman, 1987; van Dixhoorn, 2008a). One might expect that recovery of patients with a high pre-treatment score would be more difficult, but the opposite occurred. Patients with sleeping problems had, compared to other patients, the lowest pre-treatment score on the NQ, but also the lowest recovery rate. Probably only patients with the most serious sleeping problems are included in the analyses. Because of the use of the cut-off criterion, only patients with a relatively high pre-treatment score were included. The low recovery rate suggests the need for complementary treatment. At the end of treatment the scores of all patients were on average in the normal range and no significant differences in scores were found between groups.

A third explanation for the different outcomes between groups of patients is the validity of the NQ. The NQ may be more useful in measuring progression for patients with hyperventilation or problems with tension, and less suitable for patients with sleeping problems or anxiety panic and phobia. According to Van Dixhoorn (2008a) the NQ is a valid instrument to detect patients with problems which are likely to have a link with stress and tensed breathing and therefore an accurate instrument to select patients who can benefit from BRT. However, it does not reflect the effects of BRT for every complaint to the same degree (van Dixhoorn & Hoefman, 1987). Some patients scored only high on specific items on the questionnaire. Patients with sleeping problems or anxiety panic and phobia may have benefited from BRT, without a significant change on the NQ as a whole. If this explanation applies to these patients, this may have resulted in the less favorable outcome. For patients with sleeping problems only 28.6% subjectively reported an effect, which is comparable to the outcome on the NQ. Apparently, the NQ seems to be an appropriate instrument to measure the effects of BRT for these patients. The NQ seems to be less sensitive for anxiety, panic and phobia. According to 66.7% of these patients BRT was an effective treatment, which is significantly different from the improvement (46.7%) and recovery (33.3%) rates on the NQ. From these results BRT seems to be an effective treatment for patients with anxiety, panic and phobia, however the NQ is not an appropriate instrument to register the effects.

Finally, the different outcomes between groups can be explained by the presence of limiting conditions. When there are limiting conditions, tension is probably caused by other factors, and it continues to play a role in sustaining complaints, despite the treatment. Especially with category 2 or 3 limiting conditions, improvement and recovery rates are low. It seems that other treatment is called for. In this study, patients with hyperventilation and problems with tension appeared to have relatively less limiting conditions, their tension and complaints were more open to treatment by BRT.

This study had a number of limitations which has to be taken into account when interpreting the results. Research in clinical practice has, in contrast with tightly controlled research,

limitations in relation to internal validity. These limitations include uncertainties about the exact protocol of the therapy and a lack of comparison with other conditions, such as control groups without or with other treatment. On the other hand, this kind of research has advantages in relation to external validity or generalizability, as it is more closely related to daily practice compared to controlled research. To picture treatment effectiveness it is desirable to use a wide range of approaches. Both controlled trials and routinely collected clinical data are needed to decide on planning and delivering treatment services (Westbrook & Kirk, 2005). Another limitation has to do with the way the data were collected. Patients were in contact with the therapist while reporting their subjective judgment about the effectiveness of BRT and filling out the questionnaire. Data may then be distorted by social demand effects, because it is difficult to tell the therapist that they still have considerable complaints at the end of treatment. It is therefore advisable to create more anonymity in providing the data by the patient. This does not preclude collecting information during the treatment process as this may be used to tailor the therapy more to the needs of the patient. Finally, no follow-up measurement has been performed. Therefore it is not known whether the effects were lasting.

For future research it is recommended to include more patients in the analysis and to prevent social demand effects by collecting data in a more private way. Another recommendation is to look more closely to the NQ, and to evaluate the distinct items, to gain more insight in differences between the groups of patients. In this study the effects on four different groups of patients were evaluated, but BRT may be useful for a wider range of complaints, which is also a subject for further research.

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## APPENDIX

### NIJMEGEN QUESTIONNAIRE for hyperventilation complaints (NQ) Date:

Please score at every complaint, how frequently you experience such a symptom, in the past weeks, by circling one of the erect lines.

| | Never | Seldom | Sometimes | Often | Very often |
|---|---|---|---|---|---|
| 1. Chest pain | I | I | I | I | I |
| 2. Feeling tense | I | I | I | I | I |
| 3. Blurred vision | I | I | I | I | I |
| 4. Dizziness | I | I | I | I | I |
| 5. Confusion, loosing contact with reality | I | I | I | I | I |
| 6. Fast or deep breathing | I | I | I | I | I |
| 7. Shortness of breath | I | I | I | I | I |
| 8. Tightness in the chest | I | I | I | I | I |
| 9. Bloated abdominal feelings | I | I | I | I | I |
| 10. Tingling of the fingers | I | I | I | I | I |
| 11. Cannot breathe deeply | I | I | I | I | I |
| 12. Stiffness in fingers or arms | I | I | I | I | I |
| 13. Stiffness around the mouth | I | I | I | I | I |
| 14. Cold hands or feet | I | I | I | I | I |
| 15. Thumping of the heart | I | I | I | I | I |
| 16. Anxiety | I | I | I | I | I |

Name:

Age: male / female

Medication: Main complaints: