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To cite this article: Hubertus Sandler, Uta Fendel, Eva Peters, Matthias Rose, Rainer Bösel & Burghard F. Klapp (2017) Subjective experience of relaxation – induced by vibroacoustic stimulation by a Body Monochord or CD music – a randomised, controlled study in patients with psychosomatic disorders, *Nordic Journal of Music Therapy*, 26:1, 79-98, DOI: [10.1080/08098131.2015.1089312](https://doi.org/10.1080/08098131.2015.1089312)

To link to this article: <http://dx.doi.org/10.1080/08098131.2015.1089312>

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ORIGINAL RESEARCH ARTICLE

Subjective experience of relaxation – induced by vibroacoustic stimulation by a Body Monochord or CD music – a randomised, controlled study in patients with psychosomatic disorders

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ABSTRACT

Vibroacoustic stimulation via a Body Monochord can induce states of relaxation and subjective well-being. Sometimes unpleasant experiences such as fear, loss of control and unpleasant imagery can occur. Previous results were mainly deduced from investigations in healthy subjects.

In this study, we examined psychosomatic patients' subjective experiences during a single treatment with a Body Monochord in comparison to a listening session of relaxation music via audio CD. Diagnosed disorders were anxiety disorders $n = 14$, depressive disorders $n = 18$, adjustment disorder $n = 27$ and somatoform disorders $n = 6$. Each of the two treatments took approximately 20 minutes and was presented to the patients in random order. Subjective experiences were recorded via a shortened version of the Phenomenology of Consciousness Inventory. Neither clinical disorders nor psychometric scales for depressiveness and anxiety showed any influence on the emotional experience of the Body Monochord. However, patients with higher depression and anxiety scores showed a tendency to experience the CD music as less emotionally positive. The experience of relaxation induced by the Body Monochord is characterised to a greater extent by release of control (paired t -test: $p = .003$, effect size Cohen's $d = .54$). Contrary to listening sessions of the CD music, the intensity of imagery during the treatment with the Body Monochord was not related to positive emotional feelings. Possibly during treatment with the Body Monochord psychological defence mechanisms of subjects are more reduced; this may make it easier for unconscious or preconscious contents to appear.

ARTICLE HISTORY Received 24 February 2014; Accepted 30 June 2015

KEYWORDS Body Monochord; vibroacoustic stimulation; relaxation; subjective experience

Introduction

Various mind–body interventions such as autogenic training, progressive muscle relaxation, meditation, biofeedback and others can induce a relaxation response,

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 Supplemental data for this article can be accessed [here](#).

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which is characterised by decreased arousal of the sympathetic nervous system (Benson, Beary, & Carol, 1974). There is evidence in the literature that shows that mind–body interventions can have a positive effect on the treatment of different chronic physical diseases (Review: Astin, Shapiro, Eisenberg, & Forsys, 2003). There is also evidence that relaxation techniques show efficacy in the treatment of anxiety (Review: Manzoni, Pagnini, Castelnuovo, & Molinari, 2008) and can reduce self-related symptoms of depression (Review: Jorm, Morgan, & Hetrick, 2008).

In the last decades, treatment with a monochord or Body Monochord, used as body-oriented music therapy, has been adopted as a therapeutic practice in German-speaking countries. This has been documented in single-case reports (e.g. Moser, 1997; Rittner, 1997; Rittner & Fachner, 2004). Originally monochords were ancient musical instruments which were used to illustrate the mathematical relationships of musical intervals (Creese, 2010). A monochord consists of a wooden resonance box over which various strings are stretched. When movable bridges are placed under the strings, the vibration length of the strings can be modified and the division ratios of the strings related to specific intervals can be demonstrated. If all strings are tuned to the same tone pitch (or choice of octave or fifths tuning), a sound carpet with a distinct emergence of overtones and a lack of musical structural parameters like melody, harmonic change and rhythm is created by evenly stroking across the strings with the fingers of both hands.

The Body Monochord is a modern monochord development, designed for therapeutic purposes. It is composed of a resonance box, usually equipped with up to 60 strings. Body Monochords can have different shapes and forms, e.g. chairs, cradles and couches. In this study of treatment with a Body Monochord, patients lay on a resonance box in the form of a couch, which stands on four feet. On the side of the resonance box facing the floor, 60 strings in fifths tuning (tone pitches: D3, A2, D2, with additional A1 and D1 at three strings each) are attached. The Body Monochord was constructed by the manufacturer of musical instruments Bernhard Deutz in Berlin (<http://www.deutz-klangwerkstatt.de>). The strings are played by the therapist when sitting next to the Body Monochord. In addition to the acoustic sound, the patient directly perceives the vibration through contact of the patient's body with the resonance box (sound sample of the Body Monochord is available at http://psychosomatik.charite.de/forschung/koerpererleben_koerperzentrierte_therapieverfahren/).

Through the reception of monochord sounds and vibroacoustic stimulation by a Body Monochord, a feeling of deep relaxation can be experienced combined with an altered body perception, a feeling of well-being and pleasant mental images (Harthog, 2001; Jungaberle, Altieri, Gerloff, Kurze, & Verres, 2003; Rose & Wies, 2008; Sandler, Tamm, Klapp, & Bösel, 2008; Zeuch, 1999). Thus, the experience of treatment with monochord sounds shows characteristics of experiencing altered states of consciousness according to Ludwig (1966) and Farthing (1992), which can occur during various states of relaxation (Vaitl et al., 2005). However, frightening feelings of loss of control or unpleasant mental imagery can also occur (Moser, 1997; Sandler et al., 2008; Timmermann, 1989).

Various electro-cortical and neuroimaging studies on meditation and relaxation techniques indicate the activation of the anterior cingulate cortex and prefrontal areas of the brain, which are associated with focused attention and concentration (e.g. Aftanas & Golosheikine, 2001; Baijal & Srinivasan, 2010; Kubota et al., 2001; a Review is given by Cahn & Polich, 2006). Different relaxation and meditation methods use various mental self-objects like breathing, mantras and auto-suggestions which are

possibly used for focusing attention in order to reduce external distraction and to intensify self-referential attention (Cahn & Polich, 2006). Focusing one's attention and abstaining from goal-oriented analytical thinking has been discussed to be necessary for experiencing a state of relaxation (Benson et al., 1974; Smith, Amutio, Anderson, & Aria, 1996).

For relaxation induced by receptive music therapy, the object of focus is the external sound of music. Various studies have shown that music, particularly slow soothing music, can induce a psychophysiological relaxation response with reduced subjective experience of stress (Bernardi, Porta, & Sleight, 2006; Bradt & Dileo, 2009; Bradt, Dileo, Grocke, & Magill, 2011; Weeks & Nilsson, 2011; White, 1999).

In contrast to the Body Monochord, Vibroacoustic Therapy (VAT) is a better known music therapy which employs the use of music listening sessions combined with pulsating low-frequency sound vibrations (20–100 Hz), which are presented on specially designed chairs or beds with built-in loudspeakers (Punkanen & Ala-Ruona, 2012; Rogers, Ei, Rogers, & Cross, 2007). Dependent on the therapeutic aim of relaxation or activation, slow or fast pulsation is used. The music is selected according to therapeutic aims and needs of clients. In the therapeutical process, the therapist works with the client's experiences of memories, emotions and bodily sensations. Studies on various client groups have shown relaxation effects and symptom reduction (e.g. anxiety, depression, pain, fatigue) (Mariaozouls, Michel, & Schifftan, 1999; Patrick, 1999; Punkanen & Ala-Ruona, 2012). These effects seem to be especially promoted by stimulation with low frequencies (Boyd-Brewer & McCaffrey, 2004; Punkanen & Ala-Ruona, 2012; Spitzer, Rath, & Groen, 2005). The frequency spectrum of the Body Monochord used in this study also covers the low-frequency region, as there are two sets of three strings which are tuned to the tone pitches of A1 (55 Hz) and D1 (36.7 Hz).

Previous research of how monochord sounds and vibroacoustic stimulation by a Body Monochord are experienced was mainly conducted on non-clinical subjects (Harthog, 2001; Jungaberle et al., 2003; Sandler et al., 2008). Studies on the therapeutic use of monochord sounds in oncological patients demonstrated a reduction of anxiety and an increase of subjective feelings of well-being (Lee, Bhattacharya, Sohn, & Verres, 2012; Rose & Wies, 2008).

In general, patients with psychosomatic disorders showed a more negative concept of their body (self-acceptance of the body, attitude towards physical contact and physical well-being) than the healthy norm sample (Stumpf, Braunheim, Heuft, & Schneider, 2010). Since, aside from the acoustic sound experience, treatment with a Body Monochord also consists of stimulation through vibrations of the instrument which directly affects the body, the Body Monochord might have a beneficial impact on the perception of one's own body and related emotional connotations in patients suffering from these kinds of disorders. However, the fact that occasionally unpleasant or even frightening experiences may occur during monochord treatment sessions (Moser, 1997; Sandler et al., 2008; Timmermann, 1989) raises the question of what group of patients with psychosomatic disorders is the treatment with a Body Monochord a useful method for inducing a state of relaxation.

The aim of this study involving patients suffering from psychosomatic disorders was to examine whether the treatment with a Body Monochord would generate an emotional experience of relaxation, which would differ from a state induced by a relaxation

music listening session via audio CD. The hypothesis was that vibroacoustic body stimulation via the Body Monochord would induce stronger focusing of attention, resulting in a stronger state of relaxation in patients. Furthermore, we examined whether the emotional experience of the induced relaxation state would depend on the clinical disorder and the severity of depressive or anxiety symptoms such as loss of interest or difficulties in concentrating. In this context the following issue was of particular interest: whether the self-exposition of lying horizontally on one's back on a Body Monochord, combined with the lack of structure of the monochord sound would have the potential of reducing functions in orientation, which might induce a threatening feeling of loss of control in some subjects (Sandler et al., 2008), which could be related to repressiveness or anxiousness. Supposedly, without having the chance to exchange and reflect on their experiences during the treatment with the therapist, these patients would not respond positively to the Body Monochord.

Methods

Participants

In total, 85 patients (48 of which were women) aged between 21 and 76 years ($M = 48$, $SD = 12.8$) participated in the study. This sample size was chosen for statistical reasons, due to an electroencephalographic investigation (EEG) conducted at the same time (Sandler, Tamm, Rose, Klapp, & Bösel, *in press*). For detecting a medium effect-size and for being able to build subgroups in a repeated measures design (ANOVA), a sample size of about 60 patients was required. As usable data for statistical analysis generally diminishes due to measurement artefacts or individual EEG characteristics, the sample size was increased to 85 patients. The patients participated in the study during inpatient treatment at the Department of Psychosomatic Medicine at Charité – Universitätsmedizin Berlin. According to the diagnostic criteria of International Classification of Diseases (ICD-10) (Dilling, Mombour, & Schmidt, 2013), the spectrum of diagnoses was as follows: 18 patients with depressive disorder (F31, F32, F33), 13 patients with anxiety disorders (F40, F41), 27 patients with adjustment disorder (F43.2) and 27 patients with somatoform disorders (F45). The patients were selected at random for this study, which was not blinded. There were one or two dates for examination per week. As long as participants in the study were needed, any newly arrived inpatient was invited by the therapist to take part. The criterion for excluding a patient was the experience of sexual abuse due to the potential feeling of loss of control during treatment with the Body Monochord (Sandler et al., 2008), which according to our clinical experience might stimulate regressive experience and traumatic memories.

None of the patients had previous experiences with the Body Monochord. The study was approved by the ethics committee – Charité – Universitätsmedizin Berlin (application number: EA1-290-12) and informed consent was obtained from all patients. The study was conducted between October 2009 and September 2011.

Procedure

Each patient received a 20-minute session on the Body Monochord as well as a 20-minute presentation of relaxation music, which was played via audio CD. From our

experience, a treatment time of 20 minutes with the Body Monochord was quite comfortable for most patients. As the monochord sound is characterised by a lack of rhythm and dynamic changes, the musical piece “Clouds” by Osvaldo Canzani (2003) was chosen for the presentation of the relaxation music. The composition consists of birds singing, a series of similar repetitive consonant melodic phrases of panpipes with piano accompaniment, is characterised by a lack of dynamics and does not have any percussion accompaniment. The original duration time of 16.55 minutes was prolonged to 20 minutes by additional repetitions of some melodic phrases, using audio processing software. Both kinds of treatment were presented in succession with a break of 5–10 minutes in between, during which the patients answered the questionnaire on their subjective experiences. The chronological order of presentation was randomised in an alternating order. When the participants agreed to take part in the study, they did not know whether the treatment with the Body Monochord or the CD music would come first. During the audio CD session, the patients were also lying on the Body Monochord. Patients were given instructions to keep their eyes closed and to do nothing else except listen to the sounds and the music. Data acquisition of subjective experience took place between 10 a.m. and 12 p.m. because of a psychophysiological investigation conducted at the same time (Sandler et al., [in press](#)). The participants received only one single session of both treatments during their inpatient treatment in the hospital.

Defining subjective experience

Subjective experience that occurred during exposure to the Body Monochord and the receptive music therapy was recorded immediately after each treatment via a self-rating scale. The questions were based on the experience dimensions of the Phenomenology of Consciousness Inventory (PCI) by Pekala (1991; German version by Rux, 2002) for assessment of possible altered states of consciousness which can occur during various relaxation states (Vaitl et al., 2005). Through retrospective self-assessment (recorded via a 7-point (0–6) Likert scale), the PCI encompasses changes of feelings (positive/negative emotion, tension/relaxation), state of mind (altered perception, attention, self-awareness, mental images) and judgement (rationality, control).

In order to reduce the total duration of the examination, which took about two hours altogether (including fixing the EEG electrodes), the number of 53 questions of the PCI was reduced to 18, taking one question each of the following 18 dimensions of the PCI, which describe the patients’ experiences during treatments of monochord sounds and Body Monochord in former studies (Harthog, 2001; Jungaberle et al., 2003; Rose & Wies, 2008; Sandler et al., 2008). More precise meanings of the original dimensions of the PCI are given in brackets: body image (dissolution of physical boundaries), time sense (altered sense of time), perception (altered perception of the surroundings), meaning (transcendental experience), joy (feeling of joy), love (feeling of loving-kindness), sex (sexual excitement), anger (feeling of anger), fear (feeling of fear), sadness (feeling of sadness), imagery-amount (amount of imagery), imagery-vividness (intensity of imagery), direction of attention (inwardly directed attention), absorption (ability of concentration), self-awareness (reduced self-awareness), altered state of awareness (altered state of consciousness), volitional control (release of control) and arousal (relaxation). The reliabilities of the scales (Cronbach’s Alpha)

lie between $r = .69$ and $r = .92$, the average value lies at 0.82 (Pekala, 1991). Additionally, we included a question about sense of safety (feelings of safety), because this kind of experience during treatment with a Body Monochord was reported earlier (Sandler et al., 2008). Altogether 19 self-rating questions were presented (see the Appendix).

The self-rating refers to the period of the subjective experience felt during the period of the treatment sessions, and does not refer to the state that patients experienced during questioning. For that reason no pre-/post-comparison was conducted. The aim was to compare the subjective experiences during both treatments directly.

Data of additional qualitative interviews (e.g. for exploring the perception of one's own body and related emotional connotations) conducted at the end of the study of the individual patients are not addressed in the paper. Depressiveness and anxiety were measured psychometrically during standard test-psychological diagnostic assessments at the beginning of the hospital stay using the depression module of the German version of the Patient Health Questionnaire (PHQ) (Löwe, Spitzer, Zipfel, & Herzog, 2002) and the Generalized Anxiety Disorder 7-item (GAD-7) scale (Spitzer, Kroenke, Williams, & Löwe, 2006).

Data analysis

Statistical data analysis was performed using the statistical software SPSS (Version 20). The alpha error level was set at 5%. As it is likely that the use of multiple comparisons can cause significant differences to occur randomly, the Alpha error level was adjusted using Bonferroni method (multiplying the respective p -value by the number of comparisons). Item difficulty analyses were conducted according to Dahl (1971) in order to check, how well the items differentiated between the patients. The SPSS file of the data is available at the link provided in the supplementary data set section of this paper.

Main analysis of subjective experience

Graphical QQ-plots were used for testing normality in the distribution of the data, with the result that the plotted points fell approximately on a straight line, indicating that the data were modelled well by a normal distribution. Thus, differences in subjective experiences of the two treatments were tested by calculating t -tests for dependent samples. Effect size (Cohen's d) was calculated by subtracting the means and dividing the result by the pooled standard deviation.

Furthermore, we calculated an ad-hoc score for positive emotional feelings during each treatment separately for each patient. To obtain this score, the mean value of the dimensions *feeling of joy*, *feeling of loving-kindness* and *feeling of safety* was calculated. A score for negative emotional feelings with the items *fear*, *anger* and *sadness* was calculated in the same way. Cronbach's alpha, which was calculated as a measurement for internal consistency, showed acceptable values (Positive Feelings: $r = .802$; Negative Feelings: $r = .757$). Pearson correlations were carried out separately for both treatment conditions to test the relationship between both positive and negative emotional evaluation and the remaining response categories of the self-rating scales, as well as to test the

relationship between positive and negative emotional feelings and the psychometric scales for depressiveness and anxiety. For testing the differences between the correlations between the two treatments, the significance test of Raghunathan, Rosenthal, and Rubin (1996) for dependent correlations was calculated, which takes into account the dependency of two variables (positive or negative emotional feelings/remaining response categories of the questionnaire) measured at two time points (treatment Body Monochord/treatment CD music) in one sample.

Analysis of influences of specific disorders and chronological treatment order

For testing the possible influences of the chronological order of the treatments as well as of the patient's specific disorder on the subjective experience during the treatments, a linear mixed model (using full maximum likelihood estimation) was calculated separately for the various response categories, whereby the factor "treatment chronological order" was set for the repeated measures factor (diagonal covariance structure) and as a fixed effect. The covariates "kind of treatment" and "diagnosis" were set as further fixed effects. The scores of positive and negative emotional feelings as well as the remaining response categories were set as outcome variables. See the following equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon,$$

where Y is the outcome variable (value of the respective response categories), β_0 is baseline (of the respective response category), β_1 to β_4 are regression slopes, X_1 is the predictor (treatment chronological order), X_2 is the predictor (kind of treatment), X_3 is the predictor (diagnosis) and ε is the error term.

Results

Flow of participants

The characteristics (diagnoses, age, gender, scores on the PHQ and GAD-7) of the two randomised groups are shown in [Table 1](#).

Data from three subjects (suffering from anxiety disorder (1x) and somatoform disorder (2x)) were excluded from the data analysis, because they did not

Table 1. Baseline characteristics of participants.

	Body Monochord presented first $N = 43$	CD music presented first $N = 42$
Male	$N = 18$	$N = 19$
Female	$N = 25$	$N = 23$
Age	$M = 50.1$ $SD = 12.9$	$M = 45.8$ $SD = 12.6$
Anxiety disorder	$N = 7$	$N = 7$
Depressive disorder	$N = 10$	$N = 8$
Adjustment disorder	$N = 12$	$N = 15$
Somatoform disorder	$N = 14$	$N = 12$
PHQ depression	$M = 13.6$ $SD = 6.1$	$M = 14.1$ $SD = 6.7$
GAD-7 anxiety	$M = 10.5$ $SD = 5.2$	$M = 11.1$ $SD = 5.7$

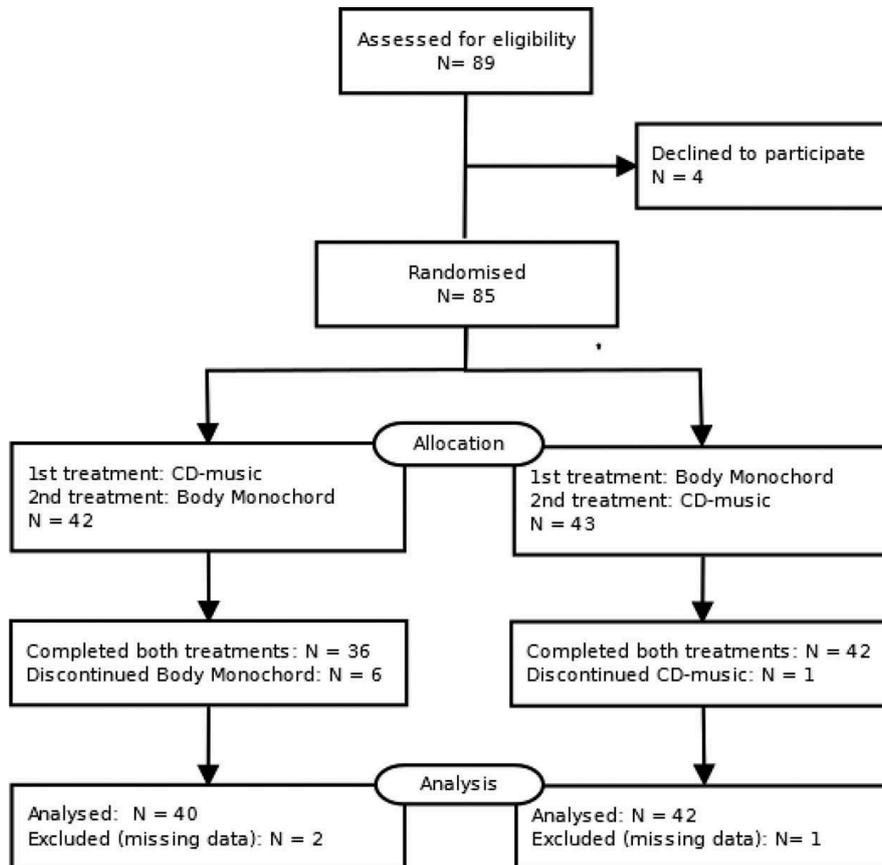


Figure 1. Flowchart of participants' progress through the phases of the trial.

fully reply to the questionnaire or questions were misunderstood. Six patients (suffering from anxiety disorder (1x), somatoform disorder (3x) and adjustment disorder (2x)) discontinued the treatment session with the Body Monochord after 10–15 minutes due to the occurrence of unpleasant feelings. For the same reason, one patient (suffering from depressive disorder) discontinued the treatment session with the CD music after 11 minutes. A flow chart of participants' progress through the phases of the trial is shown in [Figure 1](#).

Item difficulties

The negative response categories (fear, anger, sadness) showed very high item difficulties (p according to Dahl, 1971), which were as follows: fear: $p = .16$, anger: $p = .16$ and sadness: $p = .23$. This indicates that the negative response categories were pronounced marginally and differed only slightly between patients. The item “sexual excitement” was excluded from further analysis because of very high item difficulty ($p = .08$). The other response categories showed medium item difficulties between the range of .38 and .65, which implies that these items differ greatly between patients.

Effects of body monochord versus audio CD

Figure 2 shows data of subjective experience during both the Body Monochord and CD music exposure, which was obtained through self-rating scales.

Results of the t-test for dependent samples are shown in Table 2. “Release of control” indicated a significant advantage of the Body Monochord exposure (M = 4.12) when compared to CD music (M = 3.26; t = 3.91, p = .003) and showed a medium effect size (Cohen’s d = .54). The higher values for “transcendental experience” during Body Monochord treatment and the higher values for “feeling of sadness” during CD music showed small effect sizes and were only statistically significant without Bonferroni correction. The differences of the mean values of all other response dimensions were not statistically significant, although during Body Monochord exposure there was an overall tendency for higher values. Notably the values of “concentration” and “inwardly directed attention” did not differ significantly between the two treatments.

Table 3 shows the Pearson correlations between the scores of positive and negative emotional feelings and the remaining response categories of the structured interview. In both treatment conditions, we found statistically significant negative low-to-

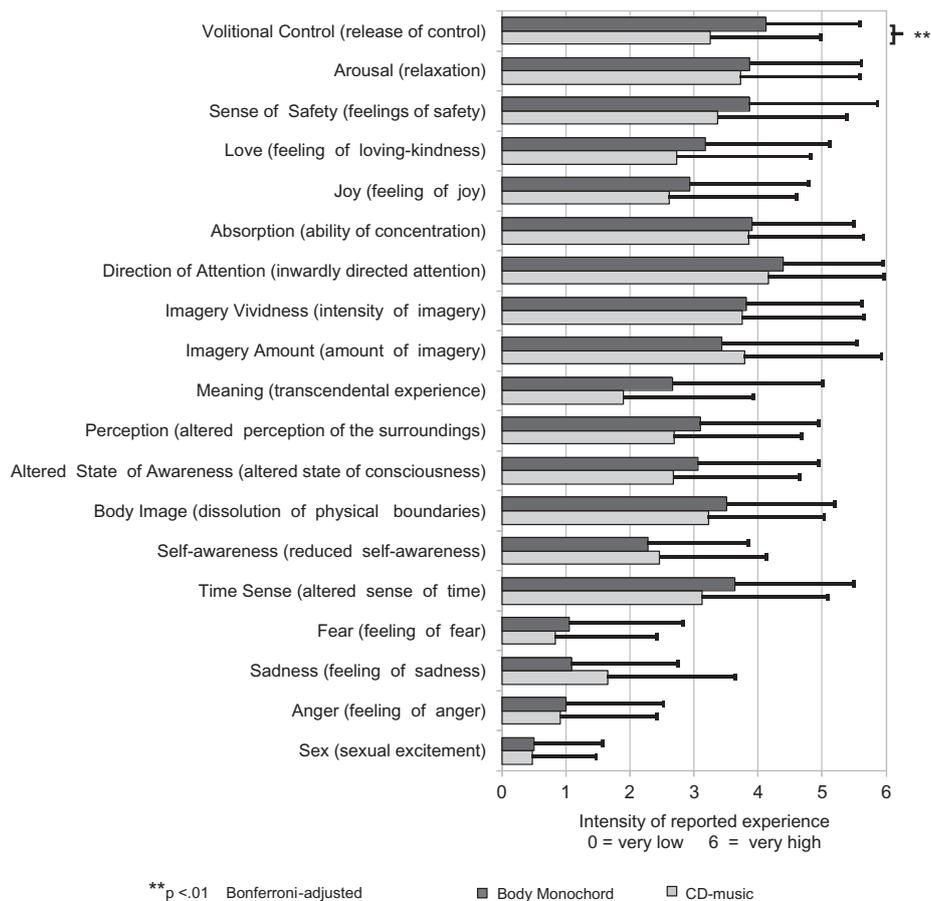


Figure 2. Subjective experience (mean values and standard deviations) during the exposure to Body Monochord and CD music, obtained via self-rating scales in the form of a 7-point Likert scale, presented immediately after the treatments.

Table 2. Paired differences between the subjective experiences of release of control, transcendental experience, and feelings of sadness between the Body Monochord and CD music.

	Paired differences Body Monochord – CD music				<i>T</i>	df	Sig. two tailed	Effect size Cohen's <i>d</i>
	Mean (SD)	Std. error	95% Confidence interval of the difference					
			Lower bound	Upper bound				
Release of control	.87 (2.01)	.22	.43	1.31	3.91	81	$p < .001$.54
Transcendental experience	.77 (2.54)	.28	.211	1.33	2.74	81	$p = .003^*$ $p = .007$ n.s.*	.35
Feeling of sadness	-.56 (2.36)	.26	-1.079	-.043	-2.16	81	$p = .034$ n.s.*	.31

Notes: The dimensions of subjective experience, which showed neither any significance nor any tendency to being significant, are not listed. *Bonferroni adjusted.

Table 3. Pearson correlation results for PCI items.

<i>N</i> = 82	Positive emotional feelings during the treatment with the Body Monochord	Positive emotional feelings during the treatment with the CD music	Significance of the differences between the levels of correlations
	Relaxation	.65 ***	.60 ***
Concentration	.57 ***	.66 ***	n.s.
Transcendental experience	.49 ***	.56 ***	n.s.
Dissolution of physical boundaries	.48 ***	.51 ***	n.s.
Release of control	.49 ***	.39 **	n.s.
Inwardly directed attention	.31 *	.40 **	n.s.
Amount of imagery	.35 *	.38 **	n.s.
Intensity of imagery	.15	.46 ***	$p < .05$
Altered perception	.22	.66 ***	$p < .001$
Altered sense of time	.26	.14	n.s.
Reduced self-awareness	-.07	.25	n.s.
Altered state of consciousness	.26	.28	n.s.
	Negative emotional evaluation of the treatment with the Body Monochord	Negative emotional evaluation of the treatment with the CD music	Significance of the differences between the levels of correlations
Relaxation	-.30**	-.41***	n.s.
Concentration	-.31**	-.50***	n.s.

Notes: Columns 2 and 3 show the Pearson correlations between the emotional evaluations of the treatments and the other answer categories of the self-rating scales, assessing subjective experience of the treatments for the two conditions "Body Monochord" and "CD music". Column 4 shows the significance of the differences between the levels of the correlations between the two treatment conditions. * $p < .05$; ** $p < .01$; *** $p < .001$. Bonferroni adjusted.

moderate correlations between *negative emotional feelings* and the response categories *concentration* and *relaxation*. The correlations between *negative emotional feelings* and the other response categories were very weak (range: $r = .01$ to $r = .2$) and not statistically significant. *Positive emotional feelings* showed in both the treatment with the Body Monochord and with the CD music statistically significant medium correlations between *dissolution of physical boundaries*, *transcendental experience* and *release of control*. The strongest correlations for both treatments were found between

positive emotional feelings and the two response categories concentration (Body Monochord: $r = .57$; CD music: $r = .67$) and relaxation (Body Monochord: $r = .65$; CD music: $r = .60$). The correlations between positive emotional feelings and the response categories inwardly directed attention and amount of imagination were statistically significant, but rather weak. The level of the correlations did not differ significantly between the treatment conditions.

For the CD music alone, statistically significant correlations were found between positive emotional feelings and the categories altered perception (Body Monochord: $r = .22$; CD music: $r = .66$) and intensity of imagination (Body Monochord: $r = .15$; CD music: $r = .46$).

Effects of the chronological order of the treatments

Table 4 shows the estimated parameters of the equation of the mixed linear model for the outcome variables, of which the predictors treatment chronological order and kind of treatment were statistically significant or showed the tendency to being significant.

Table 4. Estimated parameters for the equation of the mixed linear model for the outcome variables “positive emotional feelings”, “negative emotional feelings”, “relaxation”, “concentration”, “dissolution of physical boundaries”, “transcendental experience” and “release of control” as experience dimensions during the treatment with the Body Monochord and CD music.

Predictors for “positive emotional feelings”	β	Std. error	df	t	Sig./sig. Bonferroni
Baseline	3.21	.28	132.25	11.60	.000
Treatment chronological order	-.77	.25	152.52	-3.00	.003/.042*
Kind of treatment	.29	.25	152.86	1.18	.241
Predictors for “negative emotional feelings”	β	Std. error	df	t	Sig.
Baseline	.90	.24	140.05	3,78	.000
Treatment chronological order	.48	.21	160.14	2.26	.025/n.s.*
Kind of Treatment	-.063	.21	160.27	-.30	.762
Predictors for “relaxation”	β	Std. error	df	t	Sig.
Baseline	4.12	.31	138.03	13.52	.000
Treatment chronological order	-.89	.27	158.64	-3.26	.001 /.014*
Kind of treatment	.06	.27	158.81	.24	.810
Predictors for “concentration”	β	Std. error	df	t	Sig.
Baseline (concentration)	3.98	.30	142,30	13.31	.000
Treatment chronological order	-.54	.26	163.30	-2.07	.040/n.s.*
Kind of treatment	.05	.26	163.33	.18	.855
Predictors for “dissolution of physical boundaries”	β	Std. error	df	t	Sig.
Baseline	3.36	.31	142.06	11.06	.000
Treatment chronological order	-.54	.27	162.27	-2.04	.043/n.s.*
Kind of treatment	.28	.26	162.33	1.08	.283
Predictors for “transcendental experience”	β	Std. error	df	t	Sig.
Baseline	2.00	.39	142.28	5.12	.000
Treatment chronological order	-.19	.34	163.33	-.56	.577
Kind of treatment	.78	.34	163.35	2.34	.021/n.s.*
Predictors for “release of control”	β	Std. error	df	t	Sig.
Baseline	3.60	.29	145.41	12.55	.000
Treatment chronological order	-.45	.25	163.86	-1.85	.067/n.s.*
Kind of treatment	.85	.25	163.86	3.45	.001/.014*

Notes: Predictors, which showed neither any significance nor any tendency to being significant are not listed.
*Bonferroni adjusted.

The factor *diagnosis* was not statistically significant, so that the specific psychological disorder did not affect the emotional evaluation and the other response categories. The results reveal that the factor *treatment chronological order* (dummy variables: 0 = first treatment, 1 = second treatment) proved to be a significant predictor of *positive emotional feelings* ($\beta_1 = -.77$; $t = -3.00$; $df = 152.52$; $p = .042$, Bonferroni adjusted) and *relaxation* ($\beta_1 = -.89$; $t = -3.26$; $df = 158.645$; $p = .014$, Bonferroni adjusted). The higher values in the experienced amount of “concentration” and of the feeling of *dissolution of physical boundaries* during the first treatment and the higher values of *negative feelings* during the second treatment were only statistically significant, if the p -values were not Bonferroni adjusted. The predictor’s *treatment chronological order* was not statistically significant for the remaining outcome variables. Thus, the kind of treatment that was performed first was rated as significantly more positive and more relaxing and was rated with higher values in the experienced amount of *concentration* and of the feeling of *dissolution of physical boundaries* than the second kind of treatment.

The predictor *kind of treatment* (dummy variables: 0 = CD music, 1 = Body Monochord) was statistically significant for the outcome variable “release of control” ($\beta_1 = .85$; $t = 3.45$; $df = 163.86$; $p = .014$, Bonferroni adjusted), indicating significant higher values during the treatment with the Body Monochord, which is in accordance with the results of the Wilcoxon test. The higher values of *transcendental experience* during the treatment with the Body Monochord again failed the significance level when Bonferroni adjustment was used. For the remaining outcome variables the predictor “kind of treatment” did not show any significance.

Correlation between depression and anxiety values and emotional feelings

Table 5 shows the Pearson correlations between the psychometrical scores for depression and anxiety values from PHQ ($M = 13.8$; $SD = 6.4$; range 2–27) and GAD-7 ($M = 10.7$; $SD = 5.5$; range 1–21) and the emotional feelings during both kinds of treatment. The correlations between the values of depression and anxiety and *positive emotional feelings* during the treatment with the Body Monochord were both about zero, and the low correlations between *negative emotional feelings* during the Body Monochord were not statistically significant either. *Negative emotional feelings* during the CD music showed small, but significant positive correlations with depression and anxiety values. The small negative correlations

Table 5. Correlations between depression (PHQ)/anxiety (GAD-7) and both positive and negative emotional feelings during exposition with Body Monochord and CD music.

		Positive emotional feelings during		Negative emotional feelings during	
		Body Monochord	CD music	Body Monochord	CD music
Depression PHQ	Pearson correlation	-.03	-.22	.09	.31
	Sig. (two tailed)	.771	.088	.407	.018*
	N	81	81	81	81
General anxiety GAD-7	Pearson correlation	.01	-.23	.23	.32
	Sig. (two tailed)	.906	.072	.16	.017*
	N	82	82	82	82

Note: *Bonferroni adjusted.

between *positive emotional feelings* during the CD music and anxiety and depression values were significant only at the 10% Alpha error level. Taken as a whole, the patients with higher depression and anxiety scores tended to have a more negative experience during the CD music, whereas the anxiety and depression values did not show any significant impact on the emotional feelings during the Body Monochord.

Summary of the results of the statistical calculations

As a dimension of subjective experience, the extent of release of control was significantly higher in Body Monochord treatment than during CD music exposure and there is a tendency that the Body Monochord is experienced as more transcendental and the CD music as sadder. In all further dimensions of experience no statistically significant differences could be found. The high item difficulties and the low mean values of the emotionally negative response categories such as anxiety, anger and sadness indicate that negative emotions were not very pronounced during the expositions with the Body Monochord and the CD music and differentiated only slightly between patients.

By calculating a mixed linear model, a sequence effect was found with the result that the kind of treatment that was performed first was experienced in a more emotionally positive way than the second treatment. Furthermore, the positive emotional experience during both treatment conditions was associated with a state of relaxation and also concentration. This state of experience was aligned with a feeling of dissolution of patients own physical boundaries and was felt as being transcendental. It should be noted that the patients associated release of control with positive emotional evaluation of relaxation, which, thus, was mostly not experienced as frightening. To a lower extent, positive emotional feeling was also associated with inwardly directed attention and the amount of imagery. The intensity of imagery and altered perception of the environment was correlated with higher positive emotional feelings during the treatment with CD music, but not with the positive emotional evaluation of the treatment with the Body Monochord. Negative emotional experience was only associated with lower amounts of relaxation and concentration.

Clinical disorders did not show any influence on the emotional experience of the treatments with Body Monochord and CD music and on the further dimensions of subjective experience. However, there was a tendency for patients with higher depression and anxiety scores to experience the CD music more negatively.

Discussion

The aim of this study was to examine whether the treatment with a Body Monochord and the treatment with ordinary relaxation music via audio CD could induce different kinds of subjective experiences, especially concerning the emotional experience of relaxation. A further object of interest was whether clinically defined disorders and psychometrical scales of depressiveness and anxiety would influence the emotional evaluation of the two treatments.

We found out that the treatment presented first was experienced in an emotionally more positive and more relaxing way than the second treatment. This may in part be explained by the duration of the two treatment sessions, which took approximately

two hours altogether, including time for fixing EEG electrodes and the psychophysiological examination, which may have reduced the willingness of the patients to be involved in the second treatment. Secondly this result might also hint at the possible difficulty in mentally adjusting oneself to a new relaxation method immediately after some kind of familiarisation with another kind of relaxation method.

In general, the Body Monochord was not experienced in an emotionally more positive way than the CD music. The moderate item difficulties as well as the related high standard deviations of the response categories, which indicate emotionally positive experience and relaxation, show that a wide range of emotionally positive experiences, between both low and large extents exists. On the whole, the negative dimensions of experience like sadness, anger, and fear were not very pronounced. However, the CD music tended to be experienced as sadder than the Body Monochord. It should be underlined that six patients discontinued the treatment session with the Body Monochord and one patient stopped the session with the CD music due to unpleasant feelings and sensations that occurred during the treatments. For that reason these kinds of relaxation methods, especially the treatment with the Body Monochord, should be applied with care. By further analysis of the qualitative interviews we might come to know more precisely what kind of experience was difficult to tolerate for these patients.

The positive emotional experience of both treatments was associated in a highly significant way on the one hand by lower correlations with inwardly directed attention and on the other hand by moderate correlations with transcendental experience, dissolution of physical boundaries, release of control, concentration and relaxation. These aspects of subjective experience show similarities to the subjective experience of monochord sounds as described previously in various single-case reports (e.g. Rittner, 1997) or in studies with healthy subjects (Sandler et al., 2008). These dimensions of subjective experience both occurred during treatment with the body monochord and while listening to relaxation music via audio CD. Features of the subjective experience such as alteration of physical boundaries, relinquishing control over one's experience or the feeling of being in a transcendental state were classified by Ludwig (1966), Tart (1980) and Farthing (1992) as the experience of an altered state of consciousness. Altered states of consciousness are in general associated with experiencing mental states of relaxation (Vaitl et al., 2005). Contrary to our expectations, the additional stimulation by vibrations in the treatment with the Body Monochord did not lead to a subjective feeling of higher levels of concentration or inwardly directed attention when compared to a listening session of ordinary relaxation music.

The greater extent of *release of control* (relinquishing control over one's own experience) during the Body Monochord exposition might be ascribed to the features of the monochord sound, which are distinguished by a lack of familiar parameters of musical structures such as melody, harmonic changes and rhythm, all of which can normally give the recipient some cognitive orientation (Zeuch, 1999). Listening to the monochord sound might alleviate cognitive orientation towards solid points of reference, which in turn is likely to reduce the subjective feeling of control over one's own experience. The greater extent of release of control may also give a hint that psychological defence mechanisms might be more reduced during the treatment with the Body Monochord. Contrary to our expectations, during both treatment conditions, the relinquishing of control over one's own experience was in general associated with emotionally positive feelings and thus was not experienced as threatening.

In general, amount and intensity of imagery did not differ between the two treatment conditions. In contrast to the Body Monochord exposure, the intensity of imagery during the CD music exposure was more associated with positive emotional feelings. Thus it might be possible that different topics of imagery occurred during the two treatment conditions. It is possible that when the CD music is accepted as pleasant, the more familiar melodic and harmonic structures might encourage emotionally positive memory associations and daydreaming related to the music. The patients might be prepared to admit intense imagery only under the condition that the emotional feelings were positive.

The intensity of imagery during the treatment with the Body Monochord was not related to positive emotional feelings. Due to the lack of musical structure, the monochord sound might present a larger projection surface for one's own unconscious imagery, which could also occur if the sound is experienced as less pleasant. This might also be explained by the greater extent of relinquishing control over one's own experience during the treatment with the Body Monochord. In the therapeutic procedures of musical Katathym Imaginative Psychotherapy (Leuner, 1974), and in its American variation of Guided Imagery and Music (Summer, 2002), music is used to stimulate patients' mental imagery, which is supposed to be useful for psychotherapeutic processes. It is possible that treatment with a Body Monochord could be a further useful method to work with patients' unconscious projections in the form of mental imagery.

Clinically defined disorders according to the ICD-10 classification (affective disorder, adjustment disorder, somatoform disorder) did not show influences on results of the emotional assessment of treatment exposures. However, it should be noted that 35 patients had one of these mentioned disorders as an additional second diagnosis, so that a precise, distinct classification of the clinical disorders cannot always be made. The depression and general anxiety scores from the context of standard psychometrical diagnostics did not correlate with the positive emotional experience of the Body Monochord exposure. In contrast, patients with higher depression and anxiety scores had a tendency to experience the CD music as more emotionally negative. This result complies in part with the results of former studies, which revealed that actual mood has an influence on the emotional response to music (Cantor & Zillmann, 1973; Wheeler, 1985) and that actually experienced emotions are projected onto the music being heard (Sopchak, 1955, cited by Gembris, 1985).

Various former studies on the impact of music on relaxation and symptom reduction used self-selected music (e.g. Singh, Rao, Prem, Sahoo, & Keshav Pai, 2009; Smolen, Topp, & Singer, 2002), due to the fact that musical preferences differ between individuals. It is possible that patient-selected music is more effective in improving individual states of mood, whereas researcher-selected relaxation music might be more effective in regulating psychophysiological outcomes (Bradt & Dileo, 2009). As in this study the participants had no choice in selecting the music, this might be considered as a limitation.

Conclusion and outlook

Vibroacoustic stimulation with the Body Monochord induced an experience of relaxation which in comparison with listening to ordinary relaxation music differed mainly in the extent of relinquishing control over one's own experience. The intensity

of imagery was less dependent on positive emotional feeling compared to the listening sessions of CD music. Taken as a whole, these results might hint that during treatment with the Body Monochord patients' psychological defence mechanisms are more reduced, and thus it might be easier for unconscious or preconscious contents to appear. Possible differences in the topics of imagery between the two treatment sessions might be explored by further analysis of the qualitative interviews.

The impact on the perception of one's own body and the related emotional connotations induced by the vibrations of the Body Monochord, which directly affect the body, constitute a further interest of research. Concerning this, the collected interview data can probably also reveal additional information. It is an additional object of interest whether patients with a stronger impairment of their body image or possible fear of loss of control (e.g. like patients with eating disorders or experiences of abuse) could benefit from the treatment with a Body Monochord, or if for those patients the treatment with a Body Monochord is rather contraindicated. It is probably of particular importance if the treatment with the Body Monochord enables new experiences of body perception in these groups of patients and it is possibly useful if they are able to verbalise their experiences after the treatment.

It should be mentioned that to our knowledge research on the monochord and Body Monochord has only been carried out in German-speaking countries, and that related articles were published mainly in German journals. This might be a limitation for the present conclusions on the effects of this kind of treatment. Finally, it can be noted, that little research has been conducted concerning possible benefits for patients who have been treated with the Body Monochord in the course of several sessions over time, and that this should be addressed in the future.

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Appendix

Original dimensions and items of the PCI (Pekala, 1991) for the self-rating of subjective experience during the treatments with Body Monochord and CD music used in this study. More precise meanings of the dimensions are written in brackets. The dimension “Feeling of safety” was added by the author.

Body image (dissolution of physical boundaries)	I continually maintained a very strong sense of separation between myself and the environment.	I experienced intense unity with the world; the boundaries between me and my environment dissolved away.
Time sense (altered sense of time)	Time seemed to greatly speed up or slow down.	Time was experienced with no changes in its rate of passage.
Perception (altered perception of the surroundings)	My perception of the world changed drastically.	I noticed no changes in my perception of the world.
Meaning (transcendental experience)	I had an experience which I would label as very religious, spiritual, or transcendental.	I did not have any experience which I would label as religious, spiritual or transcendental.
Joy (feeling of joy)	I felt ecstatic and joyful.	I felt no feelings of being ecstatic or joyful.
Love (feeling of loving-kindness)	I felt intense feelings of loving-kindness.	I felt no feelings of loving-kindness.
Sex (sexual excitement)	I was not aware of any sexual feelings.	I experienced very strong sexual feelings.
Anger (feeling of anger)	I felt very angry and upset.	I felt no feelings of being angry or upset.
Fear (feeling of fear)	I felt very frightened.	I felt no emotions of being frightened.
Sadness (feeling of sadness)	I felt very, very sad.	I felt no feelings of sadness whatsoever.
Imagery amount (amount of imagery)	I experienced a great deal of visual imagery.	I experienced no visual imagery at all.
Imagery vividness (intensity of imagery)	My imagery was very vague and dim.	My imagery was as clear and vivid as objects in the real world.
Direction of Attention (inwardly directed attention)	My attention was totally directed toward the environment around me.	My attention was totally directed toward my own internal subjective experience.
Absorption (ability of concentration)	I was forever distracted and unable to concentrate on anything.	I was able to concentrate quite well and was not distracted.
Self-awareness (reduced self-awareness)	I maintained a very strong sense of self-awareness the whole time.	I did not maintain a very strong sense of self-awareness at all.
Altered state of Awareness (altered state of consciousness)	My state of consciousness was not any different or unusual from what it ordinarily is.	I felt an extremely different and unusual state of consciousness.
Volitional control (release of control)	I relinquished control and became receptive and passive to what I was experiencing.	I was wilfully controlling what I was experiencing.
Arousal (relaxation)	I felt no feelings of tension or tightness at all.	I felt tense and tight.
Safety (feeling of safety)	I felt intense feelings of safety and security.	I felt no feelings of safety and security.