



## Research Article

# The effect of resonance frequency breathing when used as a preparatory exercise in music psychotherapy: A single-case experimental study of a client with anxiety disorder



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## ABSTRACT

This study aimed at evaluating the possible benefits of starting Integrative Improvisational Music Therapy (IIMT) sessions with 10 min of Resonance Frequency Breathing (RFB), a type of slow breathing known to be beneficial for stress reduction and emotional regulation. A client diagnosed with anxiety disorder and social phobia attended 12 IIMT sessions. Using an alternating treatments design, RFB was systematically alternated with a control intervention (Vibroacoustic Therapy, VAT). Therapy processes were assessed through the Session Evaluation Questionnaire (SEQ) and the continuous measurement of Heart Rate Variability (HRV), a biomarker of autonomic nervous system response. RFB was consistently accompanied by higher HRV and followed by lower Arousal, when compared to VAT. The music psychotherapy process displayed two phases, with the first being emotionally more challenging than the second. In the first phase, the high frequency HRV component (HFnu) during music improvisations and Positivity scores were comparatively higher in sessions starting with RFB, whereas in the second phase, post-session Smoothness and Positivity were comparatively lower after RFB. The therapy outcome was positive, with marked symptom improvements. RFB appeared to have functioned as an adaptive intervention, modulating the emotional difficulty of the sessions according to the therapy phase and the client's current needs.

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## Background

Music psychotherapy is a form of arts therapy that uses music as a primary mode of expression within a psychotherapeutic context. Therapeutic change is achieved through a systematic process of intervention, based on musical experiences and the client-therapist relationship. Historically, music therapy has its roots in psychoanalysis and psychodynamic therapy (Bruscia, 1998). Although this legacy is still important, more recent theoretical influences include resource-oriented approaches (Rolvjord, 2010), as well as supportive psychotherapy, which integrates psychodynamic, cognitive-behavioural, and interpersonal models (Winston, Rosenthal, & Pinsker, 2011).

The present study focuses on a model called Integrative Improvisational Music Therapy (IIMT), originally developed at the University of Jyväskylä, Finland. The key principle of IIMT is the

synergistic alternation of verbal and music-making phases, with the idea of exploiting the specific benefits offered by each of these activities. Typically, the creation of free music improvisations (together with the therapist) helps clients express their difficult emotions and inner conflicts in a novel, symbolic, and non-threatening form, whereas the verbal phases serve the purpose of reflecting upon and processing the themes that emerged during music-making (Erkkilä, Punkanen, & Fachner, 2012). In terms of efficacy and clinical relevance, this model was used in a randomised controlled trial and shown to be more effective than standard care alone in the treatment of depression and co-morbid anxiety (Erkkilä et al., 2011).

In an attempt to develop IIMT further, we wanted to find out whether the efficacy of the model could be enhanced by the addition of a short cardiorespiratory intervention at the beginning of the sessions. Generally speaking, breathing practices are already being used for the treatment of various emotional and stress-related disorders (Brown, Gerbarg, & Muench, 2013). It is for example well-known that autonomic arousal can be reduced with slow breathing methods such as pranayama yoga (Jerath, Edry, Barnes, & Jerath, 2006; Pal, Velkumary, & Madanmohan, 2004). However, these methods are still largely used on their own, although they

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could easily be integrated into psychotherapy, where their relaxation effects could serve as a facilitator (Gerborg & Brown, 2016; Pagnini et al., 2013).

The intervention used in this study is known as Resonance Frequency Breathing (RFB), which is the central component of a method called heart rate variability biofeedback (Lehrer & Gevirtz, 2014). RFB consists in slow, paced breathing at around six breaths/min, with the actual optimal speed needing to be determined on an individual basis. When people breathe at their resonance frequency, Heart Rate Variability (HRV) is maximised and heart, respiratory, and blood pressure rhythms become highly synchronised (Vaschillo, Lehrer, Risse, & Konstantinov, 2002). This has the immediate effect of shifting the Autonomic Nervous System (ANS) toward parasympathetic (rest-and-digest) dominance, leading to a state of calm alertness (Gerborg & Brown, 2016). The fact that RFB makes people feel both relaxed and energised distinguishes it from other relaxation techniques, where relaxation might be accompanied by increased sleepiness (Smith et al., 2000).

In terms of applications, RFB has proven to be beneficial in three broad areas. First, it can promote general well-being, by reducing stress (Sutarto, Wahab, & Zin, 2012) and increasing people's ability for emotional regulation (McCraty & Zayas, 2014). Second, in the area of performance enhancement, RFB has been shown to improve cognitive performance (Prinsloo et al., 2011), sport performance (Paul & Garg, 2012), and artistic skills (Raymond, Sajid, Parkinson, & Gruzelier, 2005). Lastly, RFB has also been successfully applied in the treatment of various physical and emotional disorders, for example asthma (Lehrer, 2012), hypertension (Lin et al., 2012), chronic muscle pain (Hallman, Olsson, von Schéele, Melin, & Lyskov, 2011), anxiety disorder (Reiner, 2008), and depression (Karavidas et al., 2007). Thus, RFB appears to have the necessary qualities to potentially support and enhance the benefits that people already derive from music psychotherapy.

Nevertheless, RFB is still predominantly used as a stand-alone intervention, with very few attempts at combining it with other therapy methods. This is surprising, given its ease of use, inexpensiveness, and positive track record. Some exceptions do exist that involve using RFB alongside cognitive behavioural therapy (e.g. Reiner, 2008), but only as an additional or parallel intervention. Given the absence of pre-existing literature on the integration of RFB into psychotherapy, we widened our scope and considered any kind of relaxation method used as a preparatory intervention.

The few studies that we found involved hypnosis (Kirsch, Montgomery, & Sapirstein, 1995), mindfulness-based stress reduction (Weiss, Nordlie, & Siegel, 2005), and relaxation training (Goldfarb, Fuhr, Tsujimoto, & Fischman, 1987). Taken collectively, they indicate that the addition of some form of relaxation resulted in better outcomes and/or shorter therapy processes, which is in itself a very encouraging finding. Unfortunately, these studies focused only on outcome measures, thus shedding little to no light on how the adjunct intervention supported the mechanisms and mediators responsible for the observed therapeutic change.

There exists, however, one recent single-case study where RFB was integrated into music psychotherapy, in an attempt to support emotional processes (Brabant, Solati, Letulé, Liarmakopoulou, & Erkkilä, 2017). In that study, 10 min of RFB were applied at the beginning of every other session, in alternation with a control intervention (music listening). Paradoxically, RFB was consistently followed by *higher* stress levels during the rest of the session, because of the emergence of more negative emotions. The absence of integration problems led the authors to conclude that the temporary stress increases remained within the so-called therapeutic window of tolerance (Siegel, 1999). One should add that the client was a healthy client, meaning that the observed effects do not necessarily apply to a clinical population. The obtained results were in line with the outcome of a study on emotional regulation dur-

ing social interaction (Butler, Wilhelm, & Gross, 2006). The authors found that healthy women who displayed higher HRV during a slow-breathing task also experienced and expressed more negative emotions during conversations about an upsetting film.

From the point of view of psychotherapy, well-tolerated emotional activation and processing is something good and desirable, since in most theoretical orientations, working through one's issues is seen as essential for achieving a positive therapeutic outcome. However, with clients who are unable to down-regulate or whose default mode is constant hyperarousal, to further increase stress levels during therapy would obviously be counter-productive. On the contrary, such clients would rather benefit from a reduction in stress levels. This would allow them to stay (or return) inside their window of tolerance, which is a prerequisite for good client-therapist interaction and successful emotional processing (Ogden & Minton, 2000; Siegel, 1999).

As shown in previous studies, RFB has the ability to quickly reduce stress levels by instantly shifting the ANS toward parasympathetic dominance. Therefore, we hypothesised that RFB would have two main effects when used in a psychotherapeutic context. First of all, it would open the client up and facilitate the emergence of repressed negative emotions, which might lead to a temporary increase in stress levels (Brabant et al., 2017). This effect would mainly occur in clients having a high-enough tolerance threshold and sufficient self-regulation abilities. Secondly, through its relaxation effect, RFB would also ease the emotional burden of pre-existing negative emotions, resulting in reduced stress levels. This second effect would be especially visible in clients who are in a permanent state of hyperarousal (e.g. because of post-traumatic stress disorder). Although these postulated effects work in opposite directions, by expectedly occurring in the right amount and at the appropriate moment, both would in fact support and facilitate the client's work during therapy.

In the present study, our main objective was to expand on the findings by Brabant et al. (2017) and investigate the effects of RFB on a client formally diagnosed with an emotional disorder, in order to better understand the effects that can be expected with clients presenting specific pathologies. More specifically, we sought to answer the following research questions. Does the use of RFB as a prelude to music psychotherapy have a visible and positive impact on emotional processes? Do any observable effects differ depending on the type of client?

Concretely, in the case of a client with anxiety disorder, we hypothesised that the use of RFB would primarily decrease the perceived difficulty of the sessions, and that these difficulty decreases would also be accompanied by higher HRV levels during music-making and/or verbal interaction. Moreover, in addition to the effects attributable to the breathing exercise, we expected the results to display a trend corresponding to the changes and improvements that naturally happen during the course of therapy. Lastly, should the client indeed experience positive changes during our study, we reasonably assumed that the effects of RFB would adapt and change accordingly, possibly even leading to increased arousal and difficulty, similarly to what Brabant et al. (2017) observed in their study with a healthy client.

## Method

### Study design

We performed a single-subject study with an alternating treatments design, so as to compare the effect of RFB to the effect of a control intervention. The chosen control intervention was Vibroacoustic Therapy (VAT), which consists in applying low-frequency sound waves to the client's body through speakers or transduc-

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