

An investigation into the effects of rhythmic sensory stimulation on depression and associated symptoms

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Abstract

This study investigated the effect of music-based rhythmic sensory stimulation (RSS) on brain activity and depression symptoms of patients diagnosed with major depressive disorder. Twenty individuals formally diagnosed with Major Depressive Disorder undertook 5 weeks of RSS intervention. Participants listened to a set of designed instrumental music tracks embedded with low-frequency sounds (30–70 Hz). There were significant changes from baseline in measures of depression, sleep quality, quality of life, and anhedonia. EEG theta cordance for non-responders were lower than responders during the resting state. Music-based RSS may be a promising adjunctive treatment for Major Depressive Disorder.

Introduction

Major Depressive Disorder (MDD) is broadly characterized by persistent depressed mood and/or markedly diminished interest or pleasure

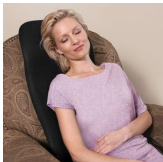
Rhythmic Sensory Stimulation: A form of periodic stimulation that can come in the form of flashing lights, vibrations, and sounds.

Evidence has shown that music has an important role in emotion evocation and hedonic regulation, and sound within 30–120 Hz has beneficial effects on pain and its associated symptoms such as depression

Aim: To investigate the effects of 30-70 Hz sound (with an emphasis on 40 Hz) on depression symptoms exhibited by patients with MDD.

RSS Device

- Sound Oasis Vibroacoustic Therapy System (VTS-1000)
- Vibrotactile and Auditory stimulus from the “Energize” option in the device (3 tracks)
- 30-70 Hz sound with an emphasis on 40 Hz



Study Design

Patients: 19 participants with MDD

Treatment: To use the VTS-1000 at home for 30 min, 5 days per week, over 5 weeks.

Timeline: Baseline visit, Treatment phase, Post-Intervention visit

Outcome measures:

- Montgomery–Asberg Depression Rating Scale (MADRS)
- Quick Inventory of Depressive Symptomatology (QIDS SR-16)
- Pittsburgh Sleep Quality Index (PSQI)
- Quality of Life Enjoyment and Satisfaction (Q-LES-Q Short Form)
- Snaith-Hamilton Pleasure Scale (SHAPS)
- Barcelona Music Reward Questionnaire (BMRQ)
- EEG resting state brain imaging
- Theta Cordance EEG

Results: Improvements in Depression Symptoms

• Out of 19 participants, 7 were classified as MDD responders to RSS defined as a 50% improvement in MADRS [1].

	Responders (n=7)		Non-responders (n=12)	
	Baseline	Post-intervention	Baseline	Post-intervention
MADRS	30.71 ± 4.88	11.71 ± 4.66**	24.58 ± 5.16	22.25 ± 7.23
QIDS	16.71 ± 3.30	5.71 ± 3.63**	11.83 ± 5.02	10.17 ± 3.95
PSQI	10.57 ± 4.31	7.29 ± 5.79*	10.17 ± 3.99	9.42 ± 3.29
QLES-Q	35.00 ± 8.85	48.00 ± 8.66*	39.25 ± 5.39	39.83 ± 6.33
SHAPS	4.14 ± 2.85	0.86 ± 1.46*	4.00 ± 2.86	4.50 ± 3.37
BMRQ	70.29 ± 6.52	74.14 ± 10.15	64.42 ± 11.23	64.67 ± 5.75

*p<0.005, * p<0.05

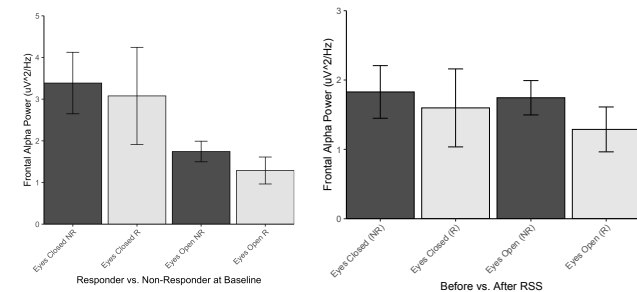
1. Janzen, T.B.; Al Shirawi, M.I.; Rotzinger, S.; Kennedy, S.H.; Bartel, L. A pilot study investigating the effect of music-based intervention on depression and anhedonia. *Front. Psychol.* 2019, 10.

EEG Alpha Power

Eyes Closed vs. Eyes Open: During baseline, there was more alpha power during the eyes closed session. This is a well known result.

At baseline and during the eyes open session, MDD Responders to RSS had lower alpha power than MDD non-Responders.

When looking at Alpha power in the eyes open session, before RSS. After RSS, there was no different found in either Responder and non-Responder group.



Conclusion

The study results indicated that there were significant changes from baseline in measures of depression and associated symptoms, including sleep quality, quality of life, and anhedonia. Responders tend to have slightly lower alpha power than non-Responders. This may indicate that response is more likely for MDD patients with more hyperactive frontal activity. These findings add the evidence that music based rhythmic sensory stimulation may be a useful adjunctive treatment for MDD.