

# The Effects of Rhythmic Sensory Stimulation on Ehlers-Danlos Syndrome: A Pilot Study

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### Abstract

Ehlers-Danlos Syndrome (EDS) is a connective tissue disorder characterized by joint hypermobility and skin extensibility<sup>1</sup>, and is often accompanied by chronic pain. Rhythmic sensory stimulation (RSS) involves periodic stimulation of one or more senses (eg. tactile or auditory) that may attenuate chronic pain symptoms. In this current study, we conducted an open-label pilot study of 15 patients with EDS using RSS as the intervention. The results indicate promising preliminary results for RSS, delivered using a vibroacoustic device, as a tool for managing pain related symptoms.

### Introduction

**Ehler's Danlos Syndrome (EDS)** is a connective tissue disorder characterized by joint hypermobility and skin extensibility, and is often accompanied by chronic pain.

**Rhythmic sensory stimulation (RSS)** involve periodic sensory stimulation that may attenuate chronic pain symptoms by: 1) inhibiting afferent nerve fibers by direct stimulation (Gate Control Theory) or 2) drive the entrainment of neural oscillatory coherence.

**Aim:** In a previous single case study, we found that RSS improves pain interference. Here we wish to further study this effect in an open label study of 15 participants with the hypermobility subtype of EDS (hEDS).

### RSS Device

- Sound Oasis Vibroacoustic Therapy System (VTS-1000)
- Vibrotactile and Auditory stimulus from the "Energize" option in the device (3 tracks)
- 41 Hz to 73 Hz with 41 Hz dominant;
- 36 Hz to 61 Hz with 41 Hz dominant;
- and 36 Hz to 65 Hz with 55 Hz dominant



### Study Design

**Patients:** 15 participants with hEDS

**Treatment:** During a 4-week study, participants used the VTS-1000 device daily for 30 minutes, five days per week.

**Timeline:** Baseline, Post-Intervention (4 weeks), washout (2 weeks)

#### Outcome measures:

- Brief Pain Inventory
- Short Form (BPI-SF)
- The Profile of Mood States Short Form (POMS-SF)
- The Short Form 36 Health Survey (SF-36)
- Center for Epidemiologic Studies Depression Scale (CES-D)

### Results: Responders to RSS

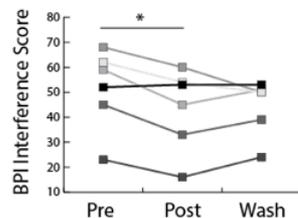
•The experience of the RSS device varied among hEDS patients, with a small subset of patients reporting their symptoms worsening.

•We determined the minimal clinically important difference (MCID) to report how many patients experienced a meaningful change post-treatment, using a previous method.

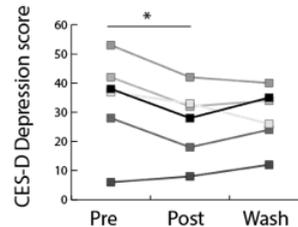
•Of the 14 patients that completed the study, 6 participants (43%) were classified as "responders" to the device while 8 participants (57%) were classified as "non-responders".

### Results: Improvements in Pain and Depression

#### Pain Interference - Responders

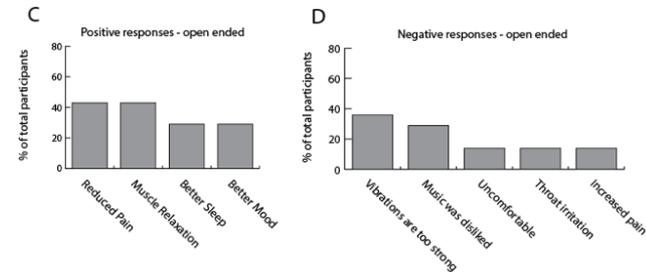
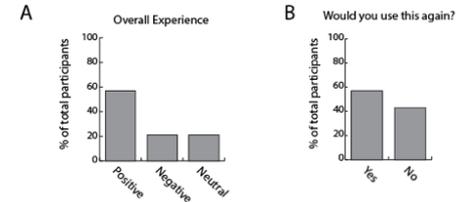


#### Depression - Responders



\* p<0.05

### Feedback on VTS-1000 Device



### Conclusion

Responders demonstrated significant improvements in pain interference and depression. Post study interviews confirm the improvements of pain interference, mood, as well as bowel symptoms. These results indicate promising preliminary results for RSS, delivered using a vibroacoustic device, as a tool for managing pain related symptoms. Further research is necessary to elucidate the exact mechanism behind the physiological benefits of RSS.