

**The Effectiveness of a
Cloud Based HRV
Biofeedback Program in
Reducing Anxiety
Symptoms in Marines and
Corpsmen with PTSD**

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Research on Co-Morbidity

- Mayou et al, 2001
 - Out of 1148 individuals involved in significant vehicle accidents, 23% developed PTSD. Over two examination periods (3 months and 1 year), both anxiety and depression showed increases. Comorbidity of general anxiety and PTSD was measured to be 47% ($P < .001$).
- Sundquist et al., 2005
 - Examined Bosnian women 4 years after arrival in Sweden. 23% were diagnosed with PTSD. Factor analysis determined 97.1% ($P < .01$) also had symptoms associated with severe anxiety
- Hashemian et al, 2006
 - 153 victims of chemical warfare. 33.6% were diagnosed with PTSD. Factor analysis determined 87% tested positive for a comorbidity of PTSD and severe anxiety.

How does a Co-morbidity develop?

- Four distinct theories portray the interaction between PTSD and other psychiatric conditions (Breslau, 2002; Solomon & Bleich, 1998)
 1. Pre-existing psychiatric conditions increase the propensity of developing PTSD after trauma
 2. Anxiety or depression may be a complication from PTSD and impact on the ANS.
 3. Co- occurrence due to shared risk factors
 4. Artifact of Symptom overlap

Correlations Identified

Severity of PTSD Symptoms

- Maes et al., 2000- identified a correlation between PTSD and anxiety comorbidity and higher scores in the PTSD symptom checklists.
- Ginzburg, Ein-Dor, Solomon, 2010- Identified a correlation between double and triple comorbidity and a significant decrease impaired functioning.

Duration of PTSD

- McFarlene, 1992- Identified a correlation between the onset of a secondary anxiety disorder and the duration of severe PTSD symptoms.
- Breslau & Davis, 1992- Postulated that recovery from PTSD is slower when a co-occurrence of anxiety/disorders are present
- Zlontnick et al., 1999- Reported findings of a .18% chance of PTSD remittance over a 5 year period when comorbidity is present

HRV Biofeedback as a Strategy

Anxiety

- Givertz (2013) argues that a considerably more amount of research is needed in the area of anxiety symptom reduction using HRV biofeedback in general, especially with the “escalating incidence of trauma survivors reactive to military and trauma experiences” (para 13).
- Lee, Kim, Wachholtz (2015)- Administered HRV Biofeedback to multiple college students to reduce anxiety. Treatment 5-10 minutes per day resulted in significant decreases in anxiety symptom severity.
- Goessl, Curtis, Hoffmann (2017)- Examined impact of HRV biofeedback on anxiety symptoms. Results suggested a significant decrease in anxiety symptoms post treatment. [Hedges $g = .81$ [95% (CI) Confidence Interval .55-1.06, $z = 6.23$, $P < .001$)]

Study Framework

- A Randomized controlled study that will include 60 Marines and Naval personnel from a recently approved study at Camp Lejeune is to test whether there are decreases in anxiety symptom severity pre-post HRV training as measured by the Patient Health Questionnaire: GAD-7. The study will utilize a repeated measures ANOVA statistical design to test the hypothesis with the level of significance set at $p > .05$.
- H_{01} : There will be no significant changes in anxiety symptom severity and frequency pre-post an HRV biofeedback treatment protocol
- H_{A1} : There will be a significant decrease in anxiety symptom severity and frequency pre-post an HRV biofeedback treatment protocol

Mobile Telehealth System

The experimental group will be instructed to use the MTS HRV biofeedback training for 10 minutes twice a day (Monday, Wednesday, Friday, and Sunday). Training is instructed to take place around one hour after waking, and one hour before bedtime, four times a week, for a four week period. The total amount of sessions each participant should reach is 32 ten minute sessions over the course of one month or 8.5 hours.

