Psychophysiological Markers of Trauma: A Descriptive Analysis Investigating the Absence of Vagal Brake in Veterans with a History of Interpersonal Trauma

California School of Professional Psychology at Alliant International University

Abstract

The main objective of our study is to examine the physiological impact of the vagal brake on male and female Veterans with a history of Interpersonal Trauma. In better understanding these relationships and processes in a population, interventions to improve physiological health of trauma victims may be developed, or implemented, that in turn influence PTSD treatment outcomes in this population.

Background

- No research in the field of psychophysiology has examined the relationship between interpersonal trauma (IPT) and vagal tone in a Veteran population.
- IPT and its sub-category of Military Sexual Trauma (MST) is a widespread problem that has been found to be associated with a number of medical and mental health outcomes.
- According to Allard & colleagues (2011) prevalence rates among female victims of MST ranged between 22% to 45%, higher prevalence rates have been found in male samples when sexual harassment experiences are included and when accurate MST definitions are incorporated.
- Kelly and colleagues (2012) identified that in 135 Veteran participants, 95% reported at least one trauma in addition to MST, most notably sexual abuse as (77%) adult civilians and (45%) children; chronic and mental physical health symptoms were present in all participants who reported at least one IPT experience in addition to MST.
- Porges (2011) recommends a unique approach to understanding the underlying physiological mechanisms of trauma through the assessment of cardiovascular regulation variables during both baseline and following a stressor.
- Titic and her colleagues (2009) demonstrated that adult women with depressed cardiac vagal tone were unsuccessful in their ability to acclimate and successfully reinstated the vagal brake following the transitory physiological state disruption due to mild exercise.
- During challenges demanding mobilization there is an intermittent withdrawal of the vagal function on the heart to increase heart rate supporting metabolic demands.
- Heart rate variability (HRV) refers to heart-to-heart interval in heart rate. The measurement of HRV provides an opportunity to monitor changes in the vagal regulation of the heart during recovery from exercise.
- Monitoring HR patterns during mild exercise, such as riding a mini exercise bike, enables evaluation of an individual’s ability to self-regulate and promote a calm state following vagal withdrawal. A cardiac recovery following exercise requires the restoration of the vagus nerve. Porges refers to this “vagal regulation of the vagus in support of social engagement behaviors” as the “vagal brake.”

Methods

- **Inclusion Criteria:**
  - Male & Female Veterans age range = 18-85
  - Undergoing therapeutic treatment/Able to participate for up to 1 hour
- **Exclusion Criteria:**
  - Undergoing therapeutic treatment/Available to participate for up to 1 hour
  - Not undergoing therapeutic treatment/Abnormal heart beats (e.g. pacemaker)
  - No reported injury or health conditions that might affect physical activity (e.g. cardiac issues or asthma)
- **Participant in clinic to ride stationary exercise bike for 10 minutes or 1 mile.
- Participants were recruited from the Veteran Affairs San Diego Healthcare Service in San Diego, California.
- Participants were placed on the first and second floor of the San Diego Veteran Affairs.
- Prospective participants were approached during the specified hours for initial assessment and determination.

Results

- No measures significantly changed between baseline and recovery from pre to post
- Heart rate changes were significant from baseline to recovery conditions in both pre F(1,19) = 17.555, ρ < .001 and post intervention F(1,19) = .121, ρ > .064.
- Changes in LnHF were significant from baseline to recovery conditions in both pre F(1,19) = .481, ρ > .064 and post intervention F(1,19) = .132, ρ > .064.
- Though not significant, SDNN trends showed from baseline to post-recovery, vagal tone was impacted by a comparable nonsignificant condition change at pre (ρ = .117) and post interventions (ρ = .386).

Table 1 Differences in Heart-rate variability Indexes Between Baseline & Post-Exercise Recovery, Pre & Post Intervention

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LnHF</td>
<td>17.555</td>
<td>11.211</td>
</tr>
<tr>
<td>SDNN</td>
<td>25.575</td>
<td>18.352</td>
</tr>
</tbody>
</table>

Discussion

- Participants with reported IPT produced impacted auto-vagal changes from mild exercise from baseline to recovery at pre and post intervention.
- During both pre and post intervention, HR increases from mild exercise and does not return to baseline in a 5 minute period. Additionally, vagal activity increases from mild exercise and did not return to baseline levels within a 5 minute recovery period.
- This outcome data shows a clear contrast to a previous study that in a normative sample of individuals without history of trauma, HRV, as measured by SDNN, did not change and that heart-rate and vagal tone return to baseline within a 5 minute recovery post-exercise period.
- These findings show that physiological profiles in individuals with a history of trauma do not greatly improve with psychotherapy, though the magnitude of the effect between recovery and baseline does show a diminishing trend. Psychotherapy alone may not be sufficient in altering physiology in those with history of trauma.
- These findings support and extend the Polyvagal Theory Model by specifying that individuals with a history of trauma are unable to successfully reinnstate the vagal brake following the transitory physiological state disruption due to mild exercise.
- Previous psychological profiles can damage physiological stress profiles, thereby creating the necessity to intervene with psychophysiological markers to help repair automatic function.

This study is limited by small sample size. However, these findings warrant further research investigating impairments in vagal withdrawal and recovery as a possible differentiation between those with history of trauma from those without.

References