Combat Exposure and Pain in Iraq and Afghanistan Veterans: The Role of Moderators and Mediators

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Combat exposure (CE) in Veterans

- Up to 81% OEF/OIF/OND Veterans report at least one CE during deployment (Street et al., 2013)
- CE linked to poor physical health, including pain (Ramchand et al., 2015; Haskell et al., 2008)
- OEF/OIF/OND Veterans with CE have higher somatic symptoms and lower physical health functioning (Godfrey et al., 2015)

Mechanisms of the CE-pain link

- PTSD (Nilni et al., 2014)
- Depression (Morasco et al., 2013)
- Resilience
Role of gender

- Male Veterans have higher rates of CE (Street et al., 2013)
- Gender moderates CE-mental health (Polusny et al., 2014) and CE-pain (Driscoll et al., 2015)
- Increasing role of female service members in combat roles
- Gender differences in combat roles (Maguen et al., 2012)
Aims:
1. determine if Veterans with CE report higher pain intensity and interference
2. examine PTSD, depression, and resilience as parallel mediators of the CE-pain link
3. explore gender as a moderator of the significant mediated pathways
Sample: Iraq and Afghanistan Veterans enrolling for services at VA San Diego Healthcare System (N = 2,683)

Self-report measures collected via tablet or paper forms:

- **Combat exposure (CE):** endorsing CE or any of 10-15 combat experiences presented such as firing at the enemy, caring for wounded, receiving small arms fire
- **Pain intensity:** numerical rating scale 0 “no pain at all” - 10 “worst pain ever”
- **Pain interference:** 7 items from PHQ-15 (stomach pain, back pain, pain in arms/legs/joints, headaches, chest pain, pain or problems during sexual intercourse) (Nillni et al., 2014)
- **PTSD:** the PTSD Checklist – Civilian Version (PCL-C)
- **Depression:** Patient Health Questionnaire 9 (PHQ-9)
- **Resilience:** Connor-Davidson Resilience Scale 10-item (CD-RISC)
Statistical analysis:

- **Aim 1:** Linear regression analysis: CE predictor and pain intensity and pain interference as outcomes
- **Aim 2:** Mediation with PROCESS macro for SPSS (Hayes, 2013): PCL-C, PHQ-9, and CD-RISC scores as simultaneous mediators of the CE-pain relationships
- Non significant mediators were dropped from the model
- **Aim 3:** Moderated mediation with PROCESS macro for SPSS (Hayes, 2013): Gender as a moderator of the significant mediated-pain relationships
- All models controlled for age
## Sociodemographics overall and by gender

<table>
<thead>
<tr>
<th></th>
<th>Total (N = 2381)</th>
<th>Men (n = 2007)</th>
<th>Women (n = 368)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age: M (SD)</strong></td>
<td>31.2 (8.3)</td>
<td>31.4 (8.5)*</td>
<td>29.8 (7.6)</td>
</tr>
<tr>
<td><strong>Ethnicity/Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic: %</td>
<td>30.0</td>
<td>29.3</td>
<td>33.8</td>
</tr>
<tr>
<td>White: %</td>
<td>61.8</td>
<td>62.7</td>
<td>56.8</td>
</tr>
<tr>
<td>Black: %</td>
<td>16.9</td>
<td>16.1</td>
<td>21.6</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school: %</td>
<td>27.0</td>
<td>28.4**</td>
<td>19.4</td>
</tr>
<tr>
<td>Some college: %</td>
<td>47.6</td>
<td>47.4</td>
<td>48.4</td>
</tr>
<tr>
<td>Associate’s degree: %</td>
<td>10.2</td>
<td>9.7</td>
<td>13.1</td>
</tr>
<tr>
<td>4 year degree/Bachelor’s: %</td>
<td>10.7</td>
<td>10.4</td>
<td>12.6</td>
</tr>
<tr>
<td>Master’s degree or higher: %</td>
<td>4.4</td>
<td>4.1</td>
<td>6.6</td>
</tr>
<tr>
<td><strong>Branch</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Army: %</td>
<td>13.6</td>
<td>14.0</td>
<td>11.8</td>
</tr>
<tr>
<td>Air Force: %</td>
<td>2.9</td>
<td>3.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Marines: %</td>
<td>31.3</td>
<td>33.8**</td>
<td>17.8</td>
</tr>
<tr>
<td>Navy: %</td>
<td>47.2</td>
<td>44.4**</td>
<td>62.5</td>
</tr>
</tbody>
</table>

*p < .001

** Standardized residual for chi-square test < -1.96 or > 1.96, which corresponds to *p < .05* for categorical variables with more than two groups.
Outcome variables overall and by CE and gender

<table>
<thead>
<tr>
<th>Total</th>
<th>Men (n = 2007)</th>
<th>Women (n = 368)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No CE</td>
<td>CE (62.6%)</td>
</tr>
<tr>
<td>Pain intensity, M (SD)</td>
<td>4.2 (2.7)</td>
<td>4.5 (2.7)</td>
</tr>
<tr>
<td>Pain interference, M (SD)</td>
<td>3.3 (2.3)</td>
<td>4.3 (2.5)</td>
</tr>
<tr>
<td>PHQ-9, M (SD)</td>
<td>4.7 (5.5)</td>
<td>8.1 (6.9)</td>
</tr>
<tr>
<td>PCL-C, M (SD)</td>
<td>5.4 (12.3)</td>
<td>37.1 (18.3)</td>
</tr>
<tr>
<td>CD-RISC, M (SD)</td>
<td>30.1 (7.6)</td>
<td>28.6 (7.8)</td>
</tr>
</tbody>
</table>
### Results

#### Pain Measures by Combat Exposure Group

<table>
<thead>
<tr>
<th></th>
<th>No combat exposure</th>
<th>Combat exposure</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$n$</td>
<td>$M$</td>
<td>$SD$</td>
<td>$n$</td>
<td>$F$</td>
</tr>
<tr>
<td>Pain intensity</td>
<td>4.39</td>
<td>2.73</td>
<td>725</td>
<td>4.94</td>
<td>2.64</td>
<td>1091</td>
<td>21.94***</td>
</tr>
<tr>
<td>Pain interference</td>
<td>3.47</td>
<td>2.37</td>
<td>916</td>
<td>4.27</td>
<td>2.53</td>
<td>1357</td>
<td>57.90***</td>
</tr>
</tbody>
</table>

**$p < .001$**

#### Linear Models

- **Pain Intensity**
  - $B = 0.56$
  - $p < 0.001$

- **Pain Interference**
  - $B = 0.84$
  - $p < 0.001$
Mediation analysis for pain intensity

Combat Exposure → PTSD → Pain Intensity

- $B = 10.42$, $p < 0.001$
- $B = 3.01$, $p < 0.001$
- $B = 0.7$, $p < 0.001$

Combat Exposure → Depression → PTSD → Pain Intensity

- $B = 3.20$, $p < 0.001$
- $B = 0.12$, $p < 0.001$
- $B = 0.04$, $p < 0.001$

Mediation analysis for pain interference

Combat Exposure → PTSD → Pain Interference

- $B = 11.21$, $p < 0.001$
- $B = 0.12$, $p < 0.001$

Combat Exposure → Depression → PTSD → Pain Interference

- $B = 3.20$, $p < 0.001$
- $B = 0.12$, $p < 0.001$
- $B = 0.04$, $p < 0.001$
Moderated mediation analysis for pain intensity

**Depression**

- $B = 0.10, p = 0.03$

**Gender**

- $B = -0.04, p = 0.06$

**PTSD**

**Combat Exposure**

**Pain Intensity**

The graph shows the relationship between PHQ9 scores and pain intensity, with separate lines for women and men. The pain intensity increases with higher PHQ9 scores.
Strengths:
- Models that examined mediators and moderators simultaneously
- eScreening: research partnership with clinical activities enabled large clinically-relevant sample

Limitations:
- Cross-sectional study
  - Causation cannot be determined
  - Pre-deployment symptoms cannot be included in models
- Less conservative and more broad estimate of CE
Research implications:

- Understanding the development of pain in Veteran populations: PTSD and depression are part of the development of pain (Schnurr & Green, 2004; Morasco et al., 2013; Poundja et al., 2006)
- Unique role of gender in the CE-depression-pain association

Clinical implications:

- Veterans with CE may have increased pain as a result of mental health issues
- Combined mental health and pain treatments, especially for female Veterans who show a stronger depression-pain link
Summary

- CE is linked to higher pain intensity and interference through PTSD and depression pathways, providing insight into mechanisms of pain development
- Female Veterans are especially at risk for higher pain intensity with increasing depression

Future research:

- Longitudinal designs to understand causality
- Assess pre-deployment trauma and objective physical health outcomes
- Broader population endorsing a wider range of pain and MH issues
- Additional mediators—both risk and protective factors
Thank you!