Association of Somatic and Affective Factors with Inflammation: MESA

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Conflict of Interest

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Background

Musselman D et al. Arch Gen Psychiatry 1998
Background

Mania, Depression → Inflammation → Pain → Substance Abuse, Smoking → Coronary Artery Disease

Sleep Disruption → Inflammation → Obesity, Insulin Resistance, Glucocorticoid Dysregulation

Inflammation → Osteoporosis

Neurodegeneration → Neuropsychological Impairment

Miller AH, Manji HK Biol Psychiatry. 2006
Inflammation

HPA – Hyperactivity
↑ Catecholamines
↑ Blood Pressure
Altered Heart Rate Variability
↑ Platelet Activity
Dysfunction tPA
↑ Inflammatory Markers

ANXIOUS
Excessive Worrying
Stressed
Panic Attacks
Overwhelmed
Nightmares

IRRITABILITY
Racing Thoughts
Poor Sleep
Altered Appetite
Altered Libido
Somatic Afflictions

Depression
Anhedonia
Lack of Energy
Poor Concentration
Loss of Interest
Isolation
In 2020: CVD and Depression #1 Cause of Disability.

Association of Depressive Symptoms and CVD.

Depressive Symptoms:
- Affective/Cognitive
- Somatic

Hoen PW et al. J Am Coll Cardiol. 2010
Roest AM et al. J Affect Disord. 2011
Deverts DJ et al. Psychosom Med. 2011
Research Questions

1. To examine the somatic and affective loading of depressive symptoms from the CES-D among MESA participants

H¹: Two factors/clusters of somatic and affective symptoms will emerge among participants in the MESA
2. Is there a significant association of somatic & affective symptoms of depression with the different inflammatory markers?

**H²**: There will be a significant association of somatic and affective symptoms of depression with inflammatory markers
Methods

- Cross-sectional Analyses
- \( n=6,818 \) participants MESA - Visit 1

**Predictors:** Somatic & Emotional Factors – CESD

**Outcomes:** IL-6, CRP, TNF-α

**Covariates:**
Demographics
Physiological
Behaviors and Comorbidities
Methods

Analysis Plan

Confirmatory Factor Analysis:
Somatic and Affective Latent Construct.

Structure Equation Modeling:
Association of Latent Factors with Inflammatory Markers
**Methods**

**CES-D Factors:**

<table>
<thead>
<tr>
<th>Negative Affect</th>
<th>Positive Affective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Felt Depressed</td>
<td>Felt good</td>
</tr>
<tr>
<td>Can’t shake the “blues”</td>
<td>Felt Happy</td>
</tr>
<tr>
<td>Felt like a Failure</td>
<td>Enjoyed Life</td>
</tr>
<tr>
<td>Fearful</td>
<td>Hopeful</td>
</tr>
<tr>
<td>Felt Lonely</td>
<td></td>
</tr>
<tr>
<td>People were Unfriendly</td>
<td></td>
</tr>
<tr>
<td>Crying Spells</td>
<td></td>
</tr>
<tr>
<td>Felt sad</td>
<td></td>
</tr>
<tr>
<td>Felt Disliked</td>
<td></td>
</tr>
</tbody>
</table>

**Somatic**

- Poor Appetite
- Concentration Difficulty
- Increased Effort
- Restless Sleep
- Unable to get Going
- Bothered by Things
- Less Talkative
# Results – Fit Indices

Confirmatory Factor Analysis : CES-D Factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>RMSEA</th>
<th>CFI</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2- Factors</td>
<td>0.04</td>
<td>0.96</td>
<td>0.02</td>
</tr>
<tr>
<td>3- Factors</td>
<td>0.04</td>
<td>0.95</td>
<td>0.03</td>
</tr>
<tr>
<td>4- Factors</td>
<td>0.04</td>
<td>0.94</td>
<td>0.03</td>
</tr>
</tbody>
</table>

2 Factors: Somatic and Negative Affect  
3 Factors: Somatic, Positive & Negative Affect  
4 Factors: Somatic, Positive, Negative Affect & Interpersonal Problems

RMSEA: Root Mean Square Error of Approximation (<0.06)  
CFI: Comparative Fix Index (>0.95)  
SRMR: Standard Root Mean Square Residual (<0.08)
Results

- Bothered by things
- Felt everything was an effort
- Poor appetite
- Poor sleep
- Could not get going
- Poor concentration
- Less talkative
Results

Negative Affect

- Feeling Blue
- Feeling Depressed
- Life is a Failure
- Fearful
- Felt Lonely
- Feeling Sad
- Crying Spells

Relationships:
- Feeling Blue: 0.7
- Feeling Depressed: 0.8
- Life is a Failure: 0.5
- Fearful: 0.5
- Felt Lonely: 0.6
- Feeling Sad: 0.7
- Crying Spells: 0.5
Results

Positive Affect

- Felt Happy: 0.7
- Felt Good: 0.3
- Enjoyed Life: 0.7
- Felt Hopeful: 0.5
Results

\[ \beta = 0.18 \]
\[ \beta = 0.20 \]
\[ \beta = 0.05 \]

Diagram:
- Somatic
- Positive Affect
- Negative Affect
- IL-6

Arrows indicating relationships with coefficients:
- Somatic to Positive Affect: 0.87
- Positive Affect to Negative Affect: 0.54
- Somatic to Negative Affect: 0.45
- IL-6 to Positive Affect: 0.18
- IL-6 to Negative Affect: 0.20
Results

\[ \beta = -0.22 \]
\[ \beta = 0.04 \]
\[ \beta = 0.65 \]

Somatic → CRP: \[ \beta = 0.65 \]
CRP → Positive Affect: \[ \beta = 0.04 \]
Positive Affect → Negative Affect: \[ \beta = -0.45 \]
Somatic → Negative Affect: \[ \beta = 0.54 \]
CRP → Somatic: \[ \beta = 0.87 \]
Results

\[ \beta = 0.21 \]
\[ \beta = -0.17 \]
\[ \beta = -0.02 \]

Diagram:
- Somatic
- Positive Affect
- Negative Affect
- TNF-\( \alpha \)

Connections:
- Somatic to Positive Affect: \(-0.45\)
- Positive Affect to Negative Affect: \(-0.54\)
- Somatic to TNF-\( \alpha \): \(0.87\)
- TNF-\( \alpha \) to Somatic: \(0.21\)
- TNF-\( \alpha \) to Positive Affect: \(-0.17\)
- TNF-\( \alpha \) to Negative Affect: \(-0.02\)
Conclusions & Implications

- There is a significant association between affective and somatic symptoms of depression with inflammation.
- The association varies depending on the inflammatory marker.
- Is there a need to measure somatic and affective symptoms separate as predictors for inflammation?