Association of Depression, Anxiety, Loneliness, and Inflammatory Markers in Women Veterans

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Background

Previous studies have found that psychological distress (depressive symptoms and anxiety) and loneliness are associated with inflammatory markers that can lead to a greater risk of inflammatory-related diseases, such as cardiovascular disease (CVD). Despite this evidence, little is known about the relationships among psychological distress, loneliness and markers of inflammation in women veterans, and more specifically the order in which this relationship occurs.

Objective

The purpose of this study was to examine the association among depressive symptoms, anxiety, loneliness and inflammation in women veterans. Furthermore, to investigate which comes first loneliness or psychological distress, and how this can impact possible interventions.

Methods

A cross sectional sample of women veterans (N=136) (mean age=50.65 SD=10.55) with risk factors for CVD participated in the study. Participants completed written measures to assess, depressive symptoms (Center for Epidemiologic Studies), anxiety (State Subscale of State-Trait Anxiety Inventory) and loneliness (UCLA Loneliness Scale). Morning blood samples were collected to measure levels of the following inflammatory markers, c-reactive protein (CRP), interleukin-6 (IL-6) production and interferon-gamma (IFN-γ) production.

Results

Table 1: Sample Demographics

Variable	Women Veterans (N=136)
Age (yrs) Mean ± SD	50.65 ± 10.55
Education	Percent (%)
Highschool or GED	2.8
Some College	42.1
College graduate	36.2
Post-college degree	20.9
Race	
Caucasian	52.9
African American	40.7
Asian	1.3
Hawaiian or Pacific Islander	1.3
Other	4.4
Ethnicity	
Not Hispanic	87.3
Latinix	12.7
Marital Status	
Married	31.0
Divorced/Separated/Widowed	42.6
Single/Never Married	26.4
Income	
Less than $25,000	44.4
$25,001-50,000	26.2
50,001-$75,000	17.5
➢ $75,000	11.9

Table 2: Partial correlations among key variables

Variables	Depressive symptoms	State Anxiety	Loneliness	IL-6	IFN-γ
Depressive symptoms	1.000				
State Anxiety	.820**	1.000			
Loneliness	.780 **	.668**	1.000		
IL-6	-.008	.090	.045	1.000	
IFN-γ	-.117	-.173	-.003	.528**	1.000
CRP	.375**	.261*	.286*	-.070	-.078

Partial correlations controlled for age and BMI.
** p<.001, *p<.05

*Leschak, C. J., & Eisenberger, N. I. (2019). Two Distinct Immune Pathways Linking Social Relationships With Health: Inflammatory and Antiviral Processes. Psychosomatic medicine, 81(8), 711–719. https://doi.org/10.1097/PSY.0000000000000685
**Kimberley J. Smith, Shannon Gavey, Natalie E. Riddell, Panagiota Kontari, Christina Victor, The association between loneliness, social isolation and inflammation: A systematic review and meta-analysis, Neuroscience & Biobehavioral Reviews, Volume 112, 2020, Pages 519-541, ISSN 0149-7634, https://doi.org/10.1016/j.neubiorev.2020.02.002.

Results

Participants reported high levels of state anxiety (m=40.85 ±14.18), depressive symptoms (m=21.38 ±13.31), and loneliness (M=47.27±13.21). Partial correlations revealed that higher levels of loneliness were associated with more depressive symptoms (r= 0.780, p<.001), anxiety (r= 0.668, p<.001), and CRP (r= 0.286, p=.008). IL-6 and IFN-γ were not associated with psychological distress. All correlations controlled for age and body mass index (BMI).

Conclusion and Implications

Results demonstrate that greater levels of loneliness are associated with more depressive symptoms, anxiety, and inflammation through CRP levels. While literature and data has not unanimously defined the pathway of loneliness and its' impact on depressive symptoms and anxiety, it is suggested that loneliness can impact how individuals cope with stress, which is a leading cause of inflammation. Specifically, because loneliness is perceived social isolation- the actual quantity and quality of these interactions compared to the desired. This adverse experience of social isolation can lead to elevated sensitivity to social stimuli, thus reducing one's likeliness to interact in positive social experiences which mitigates inflammation levels. This is all connected to the evolutionary framework that suggests that social isolation is linked to wound healing and thus higher inflammation (healing process), along with the dependence on social networks to protect one from physical threats.

With understanding the evolutionary framework and correlations of loneliness, depressive symptoms, and anxiety with elevated levels of CRP, interventions and future research can focus on improving one's perceived social isolation. This would allow for a decrease in sensitivity to social stimuli and increase in supportive social interactions to decrease depressive symptoms and anxiety.

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