

# SEX DIFFERENCES IN PAIN PERCEPTION

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*Why Do Women Experience More Pain Than Men?*

2022

# *Acknowledgments*

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## *Why Do Women Experience More Pain Than Men?*

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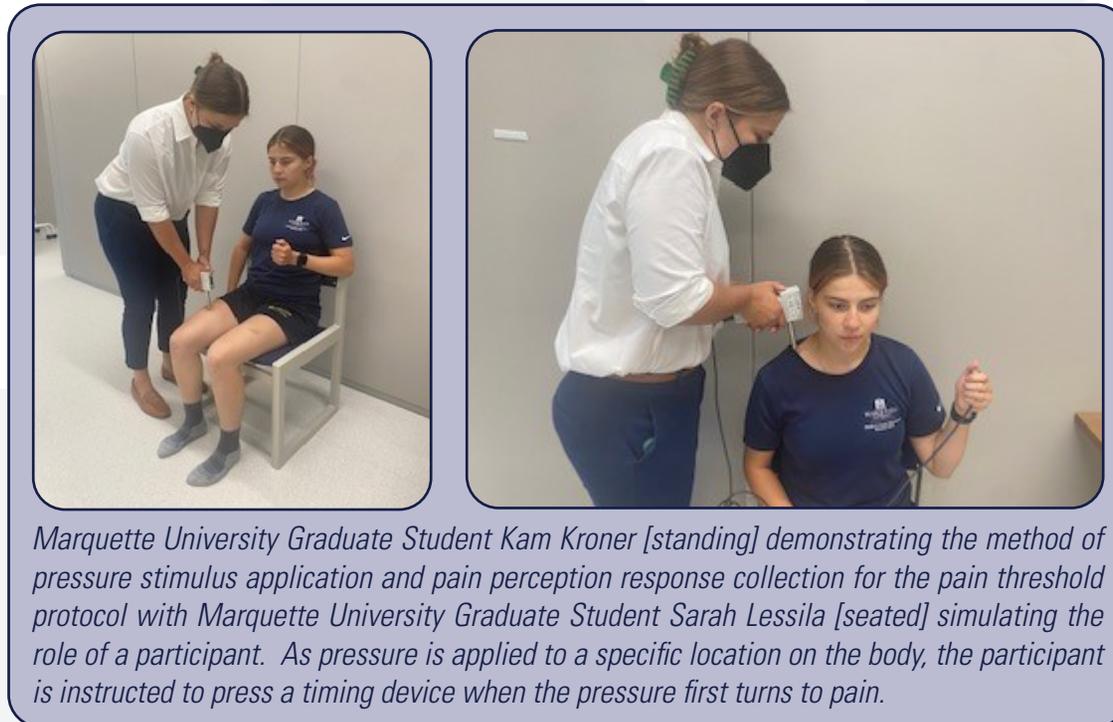
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# INTRODUCTION

Urban myth asserts that women withstand pain better than men. However, the opposite is true in that women are more sensitive to pain.<sup>1</sup> With a painful stimulus, women are more likely to report higher pain intensity and lower thresholds and tolerance.

If a pressure stimulus is applied to the body and gradually increased, a woman would be more likely to report pain sooner (lower pain threshold) and tolerate less pressure (lower pain tolerance) than a man.



<sup>1</sup> Bartley & Fillingim | “Sex Differences in Pain: A Brief Review of Clinical and Experimental Findings”  
Meints & Edwards | “Evaluating Psychosocial Contributions to Chronic Pain Outcomes”

# CHRONIC PAIN

One in five, or 50 million, adults in the U.S. experience chronic pain. Implications are staggering in that pain is the leading cause of disability worldwide.<sup>2</sup> Approximately 20 million adults in the U.S. report experiencing chronic pain that significantly impacts their daily lives (*i.e.*, high impact chronic pain).<sup>3</sup>

## CHRONIC PAIN

(noun)

reporting pain most days or every day in the previous three months

## HIGH IMPACT CHRONIC PAIN

(noun)

chronic pain that frequently limits life or work activities

Women are at greater risk than men to develop both chronic pain and high impact chronic pain.<sup>4</sup> The impacts often include poor mental health (anxiety, depression, and fatigue) and difficulty working.<sup>5</sup> In addition to differences in pain perceptions by sex/gender, other risk factors for chronic pain include increased age, rural residence, and socioeconomic factors such as living in poverty, public health insurance, and previously employed but currently unemployed.<sup>6</sup>

2 Vos, *et al.* | “Global, Regional, and National Incidence, Prevalence, and Years Lived with Disability for 328 Diseases and Injuries for 195 Countries, 1990–2016: A Systematic Analysis for the Global Burden of Disease Study 2016”

3 Dahlhamer, *et al.* | “Prevalence of Chronic Pain and High-Impact Chronic Pain Among Adults—United States, 2016”

4 Dahlhamer, *et al.* | “Prevalence of Chronic Pain and High-Impact Chronic Pain Among Adults—United States, 2016”

5 Pitcher, *et al.* | “Prevalence and Profile of High-Impact Chronic Pain in the United States”

Zelaya, *et al.* | “Chronic Pain and High-impact Chronic Pain Among U.S. Adults, 2019”

Dahlhamer, *et al.* | “Prevalence of Chronic Pain and High-Impact Chronic Pain Among Adults—United States, 2016”

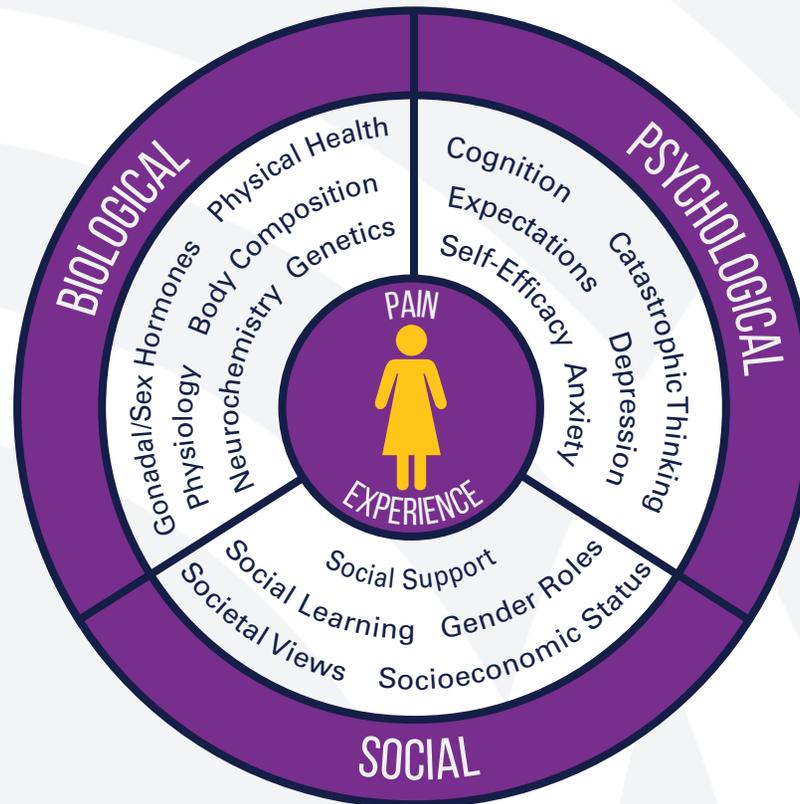
6 Zelaya, *et al.* | “Chronic Pain and High-impact Chronic Pain Among U.S. Adults, 2019”

Dahlhamer, *et al.* | “Prevalence of Chronic Pain and High-Impact Chronic Pain Among Adults—United States, 2016”

# BIOPSYCHOSOCIAL MODEL OF PAIN

How someone feels pain is influenced by an interaction of biological, psychological, and social factors (*i.e.*, the biopsychosocial model of pain) that are unique to each person.<sup>7</sup> Using this model, the pain disparities between men and women are related to gender (*i.e.*, psychosocial, see: “psychological” & “social” in the model below) and sex (see: “biological”).

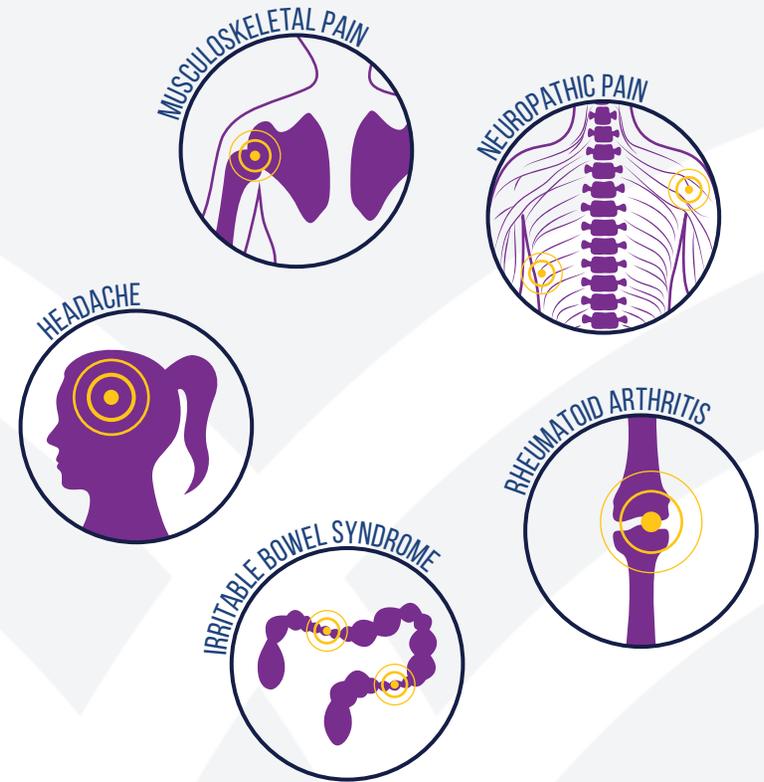
## BIOPSYCHOSOCIAL MODEL OF PAIN WITH CATEGORICAL EXAMPLES



<sup>7</sup> Cohen, *et al.* | “Chronic Pain: An Update on Burden, Best Practices, and New Advances”

# BIOPSYCHOSOCIAL MODEL OF PAIN: SEX HORMONES

Sex or gonadal hormones may have opposite effects on pain for men and women. Testosterone (primarily a male sex hormone) is associated with less sensitivity to experimental pain and increased opiate-mediated pain relief.<sup>8</sup> For women with certain medical conditions (e.g., musculoskeletal pain, neuropathic pain, rheumatoid arthritis, irritable bowel syndrome, and headaches), pain reports may change with hormonal fluctuations during their menstrual cycle.<sup>9</sup> Less is known regarding the female sex hormones in part because pain research has historically been limited to male participants.<sup>10</sup> Females were deemed too complicated due to their fluctuating hormones; however this viewpoint ignores the considerable variability in testosterone levels in males. Funding agencies, such as the National Institutes of Health (NIH), now require that females and males are similarly included in cell, nonhuman, and human research.<sup>11</sup>



## EXAMPLES OF MEDICAL CONDITIONS THAT IMPACT PAIN REPORTS ASSOCIATED WITH HORMONAL FLUCTUATIONS OF THE MENSTRUAL CYCLE

- 8 Iacovides, *et al.* | "Does Pain Vary Across the Menstrual Cycle? A Review"
- Sharp, *et al.* | "Sex Differences in Opioid Receptor Mediated Effects: Role of Androgens"
- 9 Zubieta, *et al.* | " $\mu$ -Opioid Receptor-Mediated Antinociceptive Responses Differ in Men and Women"
- Bartley & Fillingim | "Sex Differences in Pain: A Brief Review of Clinical and Experimental Findings"
- Iacovides, *et al.* | "Does Pain Vary Across the Menstrual Cycle? A Review"
- 10 Mogil | "Sex Differences in Pain and Pain Inhibition: Multiple Explanations of a Controversial Phenomenon"
- 11 Clayton & Collins | "Policy: NIH to Balance Sex in Cell and Animal Studies"

# BIOPSYCHOSOCIAL MODEL OF PAIN: BODY COMPOSITION

People who are obese are more likely to experience chronic pain due to joint stress, reduced physical fitness, and chronic inflammation that occurs with increased weight.<sup>12</sup> While previous recommendations emphasized weight loss, increasing lean mass or muscle may alleviate pain by decreasing the pain signals going to the brain.<sup>13</sup> Some of the sex differences in pain perception may be due to men having more lean mass than women.<sup>14</sup> Strength training, which increases lean mass, has excellent potential to combat pain, which holds true for women.



**Strength training**, which increases lean mass, can be an excellent activity to combat pain.

\*Please consult your healthcare professional(s) before starting.

12 Mills, *et al.* | "Chronic Pain: A Review of Its Epidemiology and Associated Factors in Population-Based Studies"  
Park & Shastri | "The Role of T Cells in Obesity-Associated Inflammation and Metabolic Disease"

13 Awali, *et al.* | "Lean Mass Mediates the Relation Between Temporal Summation of Pain and Sex in Young Healthy Adults"  
Stolzman & Hoeger Bement | "Does Exercise Decrease Pain via Conditioned Pain Modulation in Adolescents?"

14 Awali, *et al.* | "Lean Mass Mediates the Relation Between Temporal Summation of Pain and Sex in Young Healthy Adults"

# BIOPSYCHOSOCIAL MODEL OF PAIN: GENDER

Gender roles regarding femininity and masculinity affect how pain is expressed; historically there has been greater allowance for women to convey pain than men.<sup>15</sup> Gender-based life roles may also explain the greater prevalence of pain in women. The higher occurrence of chronic low back pain in women has been hypothesized to be related to musculoskeletal loads during pregnancy and the “double” workday (domestic + paid work).<sup>16</sup> As our understanding of how different societal roles affect the human body, women’s responsibilities at home and work may need to be addressed as part of a comprehensive pain management approach.

Another pain-specific psychosocial factor that commonly demonstrates gendered differences is pain catastrophizing. Pain catastrophizing refers to a negative psychological response to pain that includes magnification, helplessness, and rumination.<sup>17</sup> An abundance of research implicates the importance of pain catastrophizing in the effectiveness of pain management and development of chronic pain.<sup>18</sup> Individuals with higher levels of pain catastrophizing are more likely to report greater levels of pain and experience poorer rehabilitation outcomes. Women are more likely than men to catastrophize—thus contributing to the sex differences in reporting of daily pain, chronic pain, and experimental pain.<sup>19</sup> Some research shows

15 Meints & Edwards | “Evaluating Psychosocial Contributions to Chronic Pain Outcomes”

Robinson, *et al.* | “Gender Role Expectations of Pain: Relationship to Sex Differences in Pain.”

16 Meucci, *et al.* | “Prevalence of Chronic Low Back Pain: Systematic Review.”

17 Sullivan, *et al.* | “The Pain Catastrophizing Scale: Development and Validation”

Edwards, *et al.* | “The Role of Psychosocial Processes in the Development and Maintenance of Chronic Pain”

Meints & Edwards | “Evaluating Psychosocial Contributions to Chronic Pain Outcomes”

18 Edwards, *et al.* | “The Role of Psychosocial Processes in the Development and Maintenance of Chronic Pain”

Meints & Edwards | “Evaluating Psychosocial Contributions to Chronic Pain Outcomes”

19 Forsythe, *et al.* | “Race and Sex Differences in Primary Appraisals, Catastrophizing, and Experimental Pain Outcomes”

Keffe, *et al.* | “The Relationship of Gender to Pain, Pain Behavior, and Disability in Osteoarthritis Patients: The Role of Catastrophizing”

Edwards, *et al.* | “Catastrophizing as a Mediator of Sex Differences in Pain: Differential Effects for Daily Pain Versus Laboratory-Induced Pain”

Meints, *et al.* | “Pain-Related Rumination, But Not Magnification or Helplessness, Mediates Race and Sex Differences in Experimental Pain”

that rumination through mindfulness-based approaches could be used to address the pain disparities between men and women.<sup>20</sup>

Even with more general psychosocial contributors (*e.g.*, anxiety, social support, and social isolation),<sup>21</sup> there may be discrepancies between men and women. For instance, women are more likely to use social and emotional support as coping mechanisms.<sup>22</sup> The resulting outcome on pain may be beneficial or detrimental depending on the type of such social and emotional support.<sup>23</sup> For example, past recommendations promoted sedentary behaviors whereas current recommendations include the promotion of physical activity. In summary, when a woman is in pain, her coping strategies and the response(s) of others will impact recovery.

GROUP ACTIVITIES WITH FRIENDS  
*e.g. Walking*



20 Meints, *et al.* | "Pain-Related Rumination, But Not Magnification or Helplessness, Mediates Race and Sex Differences in Experimental Pain"

21 Edwards, *et al.* | "The Role of Psychosocial Processes in the Development and Maintenance of Chronic Pain"

Sole, *et al.* | "Social Factors, Disability, and Depressive Symptoms in Adults with Chronic Pain"

22 Sole, *et al.* | "Social Factors, Disability, and Depressive Symptoms in Adults with Chronic Pain"

23 Meints & Edwards | "Evaluating Psychosocial Contributions to Chronic Pain Outcomes"

# PHYSICAL ACTIVITY

One strategy to help women better manage their pain is physical activity. Using exercise to increase physical activity impacts all aspects of the biopsychosocial model of pain including improvements in body composition, inflammation, and emotional well-being. Additional motivation to become more active is that people who regularly participate in physical activity are less likely to develop chronic musculoskeletal pain.<sup>24</sup> Because most types of exercise provide pain relief, exercise preference should be based on the one that can be maintained long-term.<sup>25</sup> When planning to adopt any physical activities, consultation with one's healthcare professional could be warranted.

## EXAMPLES OF POTENTIAL SUSTAINABLE LIFE-LONG PHYSICAL ACTIVITIES



<sup>24</sup> Landmark, *et al.* | "Associations Between Recreational Exercise and Chronic Pain in the General Population: Evidence from the HUNT 3 Study"

<sup>25</sup> Sluka, *et al.* | "Exercise-Induced Pain and Analgesia? Underlying Mechanisms and Clinical Translation"

# CONCLUSION

While there is considerable evidence showing that women experience more pain than men, caution is advised when making definitive statements regarding sex and gender differences. Pain reports can vary significantly, even for individuals with the same condition. Understanding the dynamic nature of the biopsychosocial model of pain can help contextualize the multidimensional nature of pain that is specific to each person.<sup>26</sup> Bringing awareness to these biological, psychological, and social factors (*i.e.*, biopsychosocial factors) involved in pain is critical to empowering women in the prevention and management of pain.

## SELF-REFLECTION

Questions for Greater Understanding of One's Pain

How would I describe my pain?	
What seems to be causing my pain?	
What are my thoughts & feelings when I am experiencing pain?	
What increases my pain or makes my pain worse?	
What decreases my pain or makes me feel better/less pain?	
How do others respond when I am in pain?	
What can I do to be healthy?	
What would I do if I was no longer in pain?	

<sup>26</sup> Fillingim | "Individual Differences in Pain: Understanding the Mosaic that Makes Pain Personal"

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