



# Contributions of Ethnicity and Gender to Individual Differences in Pain Responses

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## Introduction

VOLUMES OF RESEARCH AND DECADES OF CLINICAL EXPERIENCE clearly demonstrate that pain responses are characterized by enormous individual differences (1,2). For example, two patients presenting to the emergency room with virtually identical long-bone fractures are likely to report vastly different levels of clinical pain and related distress. Similar levels of interindividual variability exist in responses to both pharmacologic and nonpharmacologic pain treatments (3).

Appreciation of the importance of individual differences has been impeded by the traditional medical model or disease model. This model emphasizes diagnosis and treatment based on the underlying pathophysiology, based on the expectations that pathology and tissue damage are the primary if not exclusive determinants of pain. However, in several chronic pain conditions (e.g., temporomandibular disorders, irritable bowel syndrome, and fibromyalgia) no clear pathophysiology has been identified. Moreover, in diseases whose pathophysiology is somewhat understood, such as rheumatoid arthritis and osteoarthritis, measures of disease activity (e.g., tender and swollen joints, radiographic measures) are relatively poor predictors of pain and function (4, 5), implying that individual difference factors may play an important role.

In contrast, the influence of individual difference factors on pain integrates quite well into the biopsychosocial model of pain, which recognizes that the experience of pain is sculpted by interactive influences among biological, psychological, and sociocultural variables (6). Thus, given the complex, multidimensional nature of pain, individual differences in pain and treatment response are inevitable and must be incorporated into our scientific and clinical efforts to enhance pain assessment and management. Therefore, an improved understanding of factors that contribute to variability in pain and analgesic responses is essential.

There are four primary sources of variability in pain responses: (a) error; (b) dispositional factors; (c) situational factors; and (d) the interaction between situational and dispositional factors. Error is the least scientifically and clinically valuable source of variability and the goal is always to reduce the effects

*(opposite)*

**Title:** I Don't Want To Be Sick  
**Media:** mixed media on wood  
**Size:** 48 inches long x 16 inches wide x 2 inches deep  
**Artist:** Mary Andrus  
 Art provided by PainExhibit.com

of error. This can be accomplished by using psychometrically sound measurement instruments, reliable and valid diagnostic approaches, and calibrated examiners, and by implementing interventions in a standardized and controlled fashion. Dispositional factors are stable characteristics of individuals (e.g., genetics, gender, race/ethnicity, personality) that can affect responses to pain and its treatment. Situational factors are transient internal or external conditions, including temporary physiological or psychological states (e.g., state anxiety, cardiovascular activation) and environmental or interpersonal conditions (e.g., temperature, time of day, characteristics of the patient-provider interaction). Of course, situational and dispositional factors often interact in complex ways, which increases the difficulty of elucidating their influences on pain.

This brief review will discuss individual differences in pain and analgesic responses, emphasizing ethnicity, sex/gender, and genetics as potentially important factors that contribute to individual differences in pain responses and treatment outcomes.

### Ethnic Differences the Experience of Pain

GIVEN THE INCREASING ETHNIC DIVERSITY of the U.S. population, the issue of ethnic differences in the experience of pain becomes particularly important. A growing body of literature suggests that clinical pain symptomatology differs across ethnic groups (7, 8). Considerable evidence from both clinical populations and community-based samples indicates greater pain severity, pain-related disability, and negative affect among African Americans compared to Whites with chronic pain (8-13). In addition, African American and Hispanic patients report greater AIDS-related pain (14, 15), and some evidence suggests greater postoperative pain compared to Whites (16). The prevalence of arthritis is greater among African Americans, and Hispanics have a higher prevalence of arthritis and report greater arthritis-related pain and activity limitations compared to Whites (17, 18). It is important to recognize that minority patients are at greater risk than Whites for undertreatment of their pain, which may contribute to these group differences in pain severity (8, 19, 20).

Based on these clinical findings, there has been renewed interest in investigating ethnic group differences in experimental pain sensitivity. Research demonstrating lower heat pain thresholds and tolerances among African American compared to White subjects dates back more than 6 decades (21). Using another pain modality, higher tolerance for cold pressor pain was reported among Whites compared to a combined group of African Americans and Hispanics (22). Some evidence suggests that group differences in pain responses among African Americans compared to Whites may be preferential for the affective versus sensory dimension of pain (23, 24). One report highlights the importance of pain scaling, as African Americans described ischemic arm pain as more intense and unpleasant

compared to Whites only when using standardized verbal descriptor scales, but not with individualized scales (25). Two recent studies demonstrated lower pain tolerances, but not pain thresholds, across three stimulus modalities (heat, cold, and ischemic pain) among African Americans compared to Whites (26, 27).

Taken together, these findings indicate that minorities, especially African Americans, report greater clinical pain, are at increased risk for undertreatment of pain, and exhibit greater sensitivity to experimental pain compared to Whites. The mechanisms underlying these ethnic differences are inevitably multifactorial and include sociocultural factors, psychological processes, and differences in endogenous pain modulation. Additional research is warranted to further explicate ethnic group differences in pain.

### Sex and Gender Differences in the Response to Pain

SEX AND GENDER DIFFERENCES IN PAIN RESPONSES have received increasing attention in recent years. Epidemiologic data consistently demonstrate sex differences in the prevalence of many forms of pain. Survey data indicate that women report higher frequency of several types of pain (28-31), and these sex differences appear greatest in middle age (30, 32, 33). With regard to specific pain syndromes, women are more likely to experience most types of headache disorders, except cluster headache (34-37), and have greater frequency of joint pain, abdominal pain, fibromyalgia, temporomandibular disorder (TMD), and low back pain (38-43). Moreover, relative to men, women report greater pain-related interference, distress, and disability (44-48), and analgesic use is more frequent among women (49, 50). These findings are not unanimous, since some results suggest increased disability among men compared to women with conditions such as low back pain (51, 52). Additional research in clinical settings provides some evidence that women report more severe pain than men, including postoperative pain (53-55), arthritis pain (45), and general chronic pain (44, 56, 57), although additional studies show no sex differences in clinical pain severity (58, 59).

While these sex differences in clinical pain undoubtedly result from a multitude of factors, it seems plausible that sex differences in pain sensitivity may play a role. Indeed, substantial evidence suggests that women display greater experimental pain sensitivity than men, such that women report lower pain thresholds and tolerances than men across multiple pain modalities (60, 61). Greater temporal summation of heat (62, 63) and mechanical pain (64) has also been reported among women, and injection of glutamate into the masseter muscle is more painful for women than men (65). Thus, compared to men, women are at greater risk for many chronic pain disorders, may experience more severe clinical pain, and show more robust perceptual responses to experimentally induced pain.

### Interactions Between Ethnicity or Gender and Other Individual Difference Factors

IN ADDITION TO THEIR MAIN EFFECTS ON PAIN, ethnicity and gender may serve as moderator variables that interact with other psychosocial or biological factors to affect pain responses. For example, several studies have indicated that the association of anxiety with clinical and experimental pain responses is stronger among men compared to women (66-69). Also, several genetic associations with pain or analgesia have been sex-dependent (70-72). With regard to ethnicity, it was recently demonstrated that neuroendocrine responses to stress influenced pain responses among Whites but not African Americans (27). Thus, the association of various biopsychosocial factors with pain responses may depend on the gender and/or ethnicity of the individual.

### Clinical Significance of Individual Differences in Response to Pain

THE NOTION THAT PAIN RESPONSES are characterized by robust interindividual variability is not new; however, individual differences have not been well integrated into clinical pain management. That ethnicity and gender influences are associated with both clinical pain and laboratory measures of pain perception is interesting, but the question remains as to whether individual differences in experimental pain provide clinically valuable information. Evidence supporting the clinical relevance of laboratory pain assessment has recently been reviewed (73). Specifically: (a) Enhanced pain sensitivity has been demonstrated in several clinical pain populations; (2) experimental pain responses predicted postsurgical pain; and (3) pretreatment pain sensitivity has predicted outcomes from treatment for chronic pain (74-76). Thus, individual differences in pain perception may provide clinically useful information.

### Conclusions and Implications

THE EXPERIENCE OF PAIN is characterized by tremendous individual differences and is influenced by multiple biopsychosocial variables, including both ethnicity and sex/gender. This has profound implications for the management of chronic pain. An enhanced understanding of the factors determining individual differences in pain and treatment responses will allow the development of individualized treatment, which will produce improved clinical outcomes.

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