

Gender Differences in Pain Anxiety: A Cross-Sectional Study

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DOI: <https://doi.org/10.47772/IJRISS.2026.100601252>

Received: 25 June 2026; Accepted: 30 June 2026; Published: 16 July 2026

ABSTRACT

Background: Pain anxiety, defined as fear of pain and pain-related sensations, is an important transdiagnostic construct influencing pain perception, avoidance behaviour, and functional outcomes. Research consistently suggests that females report higher anxiety across multiple domains; however, the specific nature of gender differences in pain anxiety, as measured by the Pain Anxiety Symptoms Scale (PASS-20), remains understudied in young Indian adults.

Objective: To examine gender differences in pain anxiety using the PASS-20 and its four subscales — cognitive, escape/avoidance, fear, and physiological anxiety — in a sample of healthy young adults aged 18–35 years.

Methods: A cross-sectional survey design was employed. Eighty participants (41 males, 39 females) aged 18–35 years were recruited via convenience sampling. Data were collected using an online Google Form incorporating the validated PASS-20 questionnaire. Descriptive statistics including mean, median, mode, and standard deviation were computed for total and subscale scores for each gender.

Results: The majority of both males (58.5%) and females (74.4%) scored in the moderate pain anxiety category (35–67). Females demonstrated a higher mean total PASS-20 score (47.07 ± 15.49) compared to males (38.00 ± 15.01), indicating greater overall pain anxiety. Across all four subscales, females scored higher than males, with cognitive anxiety showing the highest subscale scores in both groups (females: 14.86 ± 4.40 ; males: 11.31 ± 5.94) and physiological anxiety showing the lowest scores in both (females: 9.33 ± 5.31 ; males: 7.43 ± 5.73).

Conclusion: Females exhibit higher pain anxiety than males across all PASS-20 subscales, with cognitive anxiety being the dominant component in both genders. These findings support the need for gender-sensitive approaches in pain assessment and management. Clinicians should account for cognitive and emotional dimensions of pain anxiety, particularly in female patients.

Keywords: Pain Anxiety, Gender Differences, PASS-20, Cognitive Anxiety, Pain Perception, Cross-Sectional Study

INTRODUCTION

Pain is a complex, multidimensional experience that includes sensory, emotional, and cognitive components. While nociception provides the biological substrate for pain, the psychological appraisal of pain plays an equally crucial role in determining its intensity, duration, and impact on daily functioning. One of the most clinically significant psychological responses to pain is pain-related anxiety — an emotional state characterized by fear of pain, avoidance of pain-specific stimuli, and heightened physiological arousal in anticipation of or during painful experiences.

Anxiety, broadly defined as a future-oriented, long-acting emotional response to diffuse threat, has been consistently linked to amplified pain experiences. This is conceptually distinct from fear, which represents a

present-oriented, adaptive response to identifiable danger (Craske et al., 2009). In the context of pain, anxiety manifests as worry about pain consequences, hypervigilance to bodily sensations, and catastrophic appraisal — all of which are known to lower the pain threshold and exacerbate disability (Vlaeyen & Linton, 2000).

Gender differences in pain sensitivity and pain-related emotional responses have been extensively documented in the literature. The International Association for the Study of Pain (IASP) highlighted in its 2024 Global Year campaign that women are generally more sensitive to pain, have greater vulnerability to many painful conditions, and experience more pain across the lifespan (IASP, 2024). Epidemiological studies indicate that women report a higher prevalence and greater severity of chronic pain conditions, including fibromyalgia, temporomandibular disorders, and migraine, compared to men. Additionally, women are more likely to present at pain clinics and to seek pain-related healthcare than their male counterparts.

The biological underpinnings of these differences are complex and not yet fully understood. Sex hormones — particularly estrogen, progesterone, and testosterone — are known modulators of nociception. Estrogen exerts both pronociceptive and antinociceptive effects depending on dose and receptor subtype, while testosterone has been associated with pain-reducing effects through its action on descending inhibitory pathways (IASP, 2024). Gonadal hormones also influence neurotransmitter systems relevant to pain and mood, including serotonin, norepinephrine, and the endogenous opioid system (Cagnacci & Venier, 2023).

Beyond biological factors, psychosocial variables also shape gender differences in pain and anxiety. Sociocultural norms around pain expression, coping styles, and health-seeking behaviour differ between genders. Research shows that anxiety disorders are approximately twice as prevalent in women as in men, a disparity attributed to both biological vulnerability and differential exposure to psychosocial stressors (Global Burden of Disease Study, 2021). Importantly, anxiety has been demonstrated to increase pain intensity and is more strongly associated with pain catastrophizing and disability in clinical populations.

The Pain Anxiety Symptoms Scale (PASS) is one of the most widely used and rigorously validated tools for assessing pain-related anxiety. Originally developed by McCracken et al. (1992) as a 40-item instrument, the PASS-20 is a shortened 20-item version that retains four theoretically and empirically distinct subscales: (1) cognitive anxiety, reflecting anxious thoughts about pain; (2) escape/avoidance, representing behavioural tendencies to avoid pain-eliciting situations; (3) fear of pain, capturing direct emotional responses; and (4) physiological anxiety, encompassing autonomic arousal in response to pain. The PASS-20 demonstrates excellent internal consistency (Cronbach's $\alpha = 0.93$) and has been validated across diverse clinical and non-clinical populations, including evidence for measurement invariance across sex groups (Rogers et al., 2020).

Despite the availability of validated tools and growing research interest, studies examining gender differences specifically in pain anxiety among young adults in India remain few. Understanding these differences is critical, as young adulthood represents a formative period during which pain experiences, anxiety patterns, and health behaviours are established. This study was therefore designed to systematically compare pain anxiety levels between males and females aged 18–35 years using the PASS-20, to inform gender-sensitive clinical practice in pain management and physiotherapy.

METHODS

Study Design

A cross-sectional observational study design was employed. Cross-sectional designs are appropriate for assessing the prevalence of a condition and comparing between-group differences at a single point in time, without experimental manipulation.

Participants

Eighty participants (41 males and 39 females) between the ages of 18 and 35 years were recruited through convenience sampling. This age bracket was selected to capture the young adult population, a group with relatively high physical activity and evolving pain experiences.

Inclusion criteria: individuals of either sex identifying as male or female, aged 18–35 years, who were able to read and comprehend English, and who provided informed consent to participate. Exclusion criteria: inability to read or understand English, as the PASS-20 instrument administered was in English and language comprehension is essential for valid self-report data.

Outcome Measure

The *Pain Anxiety Symptoms Scale – 20 item version (PASS-20)* was the primary outcome measure. The PASS-20 is a validated 20-item self-report instrument assessing pain-related anxiety across four subscales of five items each: cognitive anxiety (items 1–5), escape/avoidance (items 6–10), fear of pain (items 11–15), and physiological anxiety (items 16–20). Each item is rated on a 6-point Likert scale from 0 (never) to 5 (always), yielding a total score ranging from 0 to 100. Score ranges are interpreted as: 0–34 = mild pain anxiety; 35–67 = moderate pain anxiety; 68–100 = severe pain anxiety (McCracken et al., 1992; Abrams et al., 2007).

Data Collection Procedure

Data were collected using Google Forms, an online survey platform. Participants were directed to the form via a shared link. The form included a brief explanation of the study's purpose, a statement of confidentiality, and the 20-item PASS questionnaire. No personal identifying information beyond age and gender was collected. Data collection was conducted over a defined period and all responses were anonymous.

Data Analysis

Descriptive statistics were computed for all outcome variables. For each gender group, the following were calculated: frequency distribution across mild, moderate, and severe PASS categories; total PASS mean, median, mode, and standard deviation; and subscale means with standard deviations for cognitive, escape/avoidance, fear, and physiological anxiety. Age descriptive statistics (range, mean, SD) were computed for each group separately. Data were organized and analysed using standard statistical methods appropriate for descriptive cross-sectional research.

Results

Demographic Characteristics

The total sample comprised 80 participants — 41 males (51.2%) and 39 females (48.8%). The age distribution across both groups is presented in Table 1. The male participants had a mean age of 18 years (SD = 2.90), with ages ranging from 18 to 35. The female participants had a mean age of 18 years (SD = 4.63), with ages ranging from 18 to 33.

Table 1. Age distribution of participants by gender

Age Group	Females (n)	Males (n)	Total (n)
18–23 years	12	19	31
24–29 years	25	17	42
30–35 years	2	4	6
Total	39	41	80

PASS-20 Score Distribution

The distribution of total PASS-20 scores across severity categories is summarized in Table 2. The majority of participants in both groups fell within the moderate pain anxiety category (scores 35–67). Among males, 58.5% scored in the moderate range and 39.0% in the mild range, with only 1 participant (2.4%) in the severe category. Among females, 74.4% scored moderately, 20.5% scored in the mild range, and 5.1% (n = 2) in the severe category. The proportion of females in the moderate category was notably higher than that of males.

Table 2. Distribution of PASS-20 severity categories by gender

Category (Score Range)	Females, n (%)	Males, n (%)
Mild (0–34)	8 (20.5%)	16 (39.0%)
Moderate (35–67)	29 (74.4%)	24 (58.5%)
Severe (68–100)	2 (5.1%)	1 (2.4%)

Descriptive Statistics for Total PASS-20 Scores

Table 3 presents the descriptive statistics for total PASS-20 scores. Females had a mean score of 47.07 (SD = 15.49), a median of 49, and a mode of 50. Males had a mean score of 38.00 (SD = 15.01), a median of 38, and a mode of 53. These figures indicate that females exhibited higher central tendency values for pain anxiety compared to males, with a difference of approximately 9 points on the mean total score.

Table 3. Descriptive statistics for total PASS-20 scores by gender

Statistic	Females	Males
Mean	47.07	38.00
Median	49	38
Mode	50	53
SD	15.49	15.01

Subscale Analysis

Table 4 presents the mean scores and standard deviations for each PASS-20 subscale, stratified by gender. Females scored higher than males on all four subscales. The cognitive anxiety subscale yielded the highest mean scores in both females (14.86 ± 4.40) and males (11.31 ± 5.94), suggesting that cognitive processes represent the dominant dimension of pain anxiety in this sample regardless of gender. The physiological anxiety subscale registered the lowest mean scores in both females (9.33 ± 5.31) and males (7.43 ± 5.73).

Table 4. PASS-20 subscale scores by gender (Mean $\pm$ SD)

Subscale (Items)	Females (Mean $\pm$ SD)	Males (Mean $\pm$ SD)
Cognitive Anxiety (1–5)	14.86 ± 4.40	11.31 ± 5.94
Escape/Avoidance (6–10)	13.23 ± 5.35	10.58 ± 4.95
Fear of Pain (11–15)	9.66 ± 4.77	8.65 ± 5.86
Physiological Anxiety (16–20)	9.33 ± 5.31	7.43 ± 5.73
Total Score	47.07 ± 15.49	38.00 ± 15.01

DISCUSSION

The present cross-sectional study examined gender differences in pain anxiety among young adults aged 18–35 years using the validated PASS-20. The primary finding is that females demonstrated higher mean total pain anxiety scores (47.07 ± 15.49) compared to males (38.00 ± 15.01), with a greater proportion of females falling

in the moderate pain anxiety category (74.4% vs. 58.5%). Notably, females also scored higher on all four PASS-20 subscales, with cognitive anxiety emerging as the predominant dimension across both genders.

These findings are consistent with the broader literature on gender differences in anxiety and pain. Vambheim and Øien (2017) demonstrated that females report significantly higher fear of pain than males using the Fear of Pain Questionnaire III (FPQ-III) in a nonclinical sample. Similarly, the IASP (2024) Global Year fact sheet on sex and gender differences in pain summarises robust evidence that women experience greater pain sensitivity and are more prone to developing pain-related anxiety conditions. Our results extend this evidence specifically to pain anxiety in a young adult cohort.

The finding that cognitive anxiety was the highest-scoring subscale in both groups is particularly clinically important. Cognitive pain anxiety — encompassing catastrophising thoughts, worry about pain consequences, and negative automatic thoughts about pain — has been established as a key driver of pain-related disability (Vlaeyen & Linton, 2000; Woo, 2010). Higher cognitive anxiety in females may reflect both the greater general anxiety vulnerability observed in this gender and the influence of sociocultural factors that shape how pain is appraised and communicated. Importantly, females showed a larger absolute difference from males on cognitive anxiety (mean difference ~3.5 points) compared to physiological anxiety (~1.9 points), suggesting that psychological rather than somatic dimensions may be particularly salient drivers of the gender gap in pain anxiety.

Several biological mechanisms may account for the observed gender differences. Sex hormones — particularly estrogen, progesterone, and testosterone — are established modulators of nociception. Estrogen exerts complex, dose-dependent effects: while higher concentrations may be antinociceptive, fluctuating or lower estrogen levels have been shown to be pronociceptive (IASP, 2024; Cagnacci & Venier, 2023). Testosterone, in contrast, appears to reduce pain sensitivity through its effects on descending inhibitory pain pathways in both males and females; the relatively higher testosterone levels in males may therefore confer some protection against pain-related anxiety (IASP, 2024). Furthermore, neuroendocrine pathways involving prolactin — whose receptor expression in sensory neurons is upregulated by estrogen — have been implicated in sex-specific mechanisms of pain chronification and hyperalgesia (Bhatt et al., 2020). These biological differences provide a plausible neurobiological substrate for the gender gap in pain anxiety observed in our sample.

Psychosocial factors are equally important in explaining the observed differences. Research shows that anxiety disorders are approximately twice as prevalent in women as in men globally, with the female-to-male ratio estimated at 2:1 (GBD Study, 2021). Women are also more vulnerable to anxiety symptoms following stressful events and employ different coping strategies compared to men. Emotion-focused coping, more commonly adopted by females, involves deeper cognitive processing and rumination about stressful events, which may amplify pain-related worry and catastrophising — processes directly captured by the cognitive anxiety subscale of the PASS-20 (Lazarus & Folkman, 1984; Means-Christensen et al., 2008).

The relationship between musculoskeletal pain and psychological factors is also relevant to interpreting our findings. Research on emerging adults reveals that females report a higher prevalence of multisite musculoskeletal pain than males (37% vs. 26%) and that moderate-to-severe multisite pain is associated with the highest levels of anxiety, depression, and stress in both genders (Farr et al., 2023). Pain and anxiety thus co-occur in a bidirectional relationship: anxiety amplifies pain, and pain amplifies anxiety. This reinforces the relevance of studying pain anxiety specifically in young adults, as patterns established at this stage may influence future pain and mental health trajectories.

The escape/avoidance subscale also showed higher scores in females than males. Pain-related avoidance behaviour is a central component of the fear-avoidance model of chronic pain (Vlaeyen & Linton, 2000), in which pain-related fear leads to avoidance of activity, which in turn maintains and exacerbates pain and disability. The finding that females score higher on this subscale suggests they may be more prone to developing avoidance patterns, which has direct implications for physiotherapy-based pain rehabilitation — particularly approaches such as graded exposure and acceptance and commitment therapy.

The physiological anxiety subscale, which reflects autonomic reactivity to pain (e.g., heart racing, sweating, dizziness in anticipation of pain), showed the lowest scores in both genders and the smallest mean difference between them. This may suggest that autonomic reactivity to pain is relatively similar across genders in young, healthy adults, with the more pronounced divergence occurring at the cognitive and behavioural levels.

From a clinical standpoint, these results have direct implications for physiotherapy practice. Pain assessment protocols should incorporate standardised tools such as the PASS-20 to capture the psychological dimensions of pain alongside physical findings. Given that females demonstrate higher cognitive pain anxiety, cognitive-behavioural strategies — including pain education, cognitive restructuring, and mindfulness-based approaches — may be particularly beneficial in female patients. Male patients, despite lower overall scores, should not be overlooked: a substantial proportion (58.5%) still fell in the moderate category, underscoring the universality of pain anxiety as a clinical concern.

Several limitations of this study warrant acknowledgement. The sample size of 80 participants, while adequate for a preliminary descriptive study, limits the generalisability of findings. The unequal distribution between males and females (41 vs. 39) and the relative homogeneity of the sample (predominantly younger adults aged 18–23) may not represent the full spectrum of the target population. The cross-sectional design precludes causal inference — it is not possible to determine whether anxiety predisposes individuals to pain or whether pain experience increases anxiety. Data were collected exclusively via online self-report, which is subject to social desirability bias and excludes individuals without internet access. Additionally, no inferential statistical tests (e.g., independent samples t-test) were formally conducted to determine the statistical significance of the observed gender differences, which represents a gap that future work should address. Future studies should employ larger, more representative samples with equal gender distribution, include clinical populations alongside healthy controls, and use inferential statistics and longitudinal designs to establish the directionality of the relationship between gender and pain anxiety.

CONCLUSION

The present study demonstrates that females exhibit higher levels of pain anxiety than males across all dimensions of the PASS-20, with cognitive anxiety being the most prominent subscale in both genders. The majority of participants in both groups presented with moderate pain anxiety, highlighting that pain-related anxiety is a prevalent and clinically relevant phenomenon in young adults. These findings underscore the importance of gender-sensitive approaches in pain assessment, clinical decision-making, and the development of targeted interventions. Screening for and addressing cognitive pain anxiety, particularly in female patients, should be integrated into physiotherapy and pain management practice to optimise outcomes.

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