



## Sensory Processing Sensitivity In Adults With And Without Tension-Type Headache: Moderating Role Of Pain Catastrophizing

*Yasmeen Zahra\**

International Islamic University Islamabad, Pakistan

Email: [yasmeen13272@gmail.com](mailto:yasmeen13272@gmail.com)

*Nazia Iqbal*

International Islamic University Islamabad, Pakistan

Email: [Nazia.iqbal@iiu.edu.pk](mailto:Nazia.iqbal@iiu.edu.pk)

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### **Abstract**

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#### **Keywords:**

*pain  
catastrophizing;  
sensory processing  
sensitivity;  
tension-type  
headache*

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*Little is known about the relationship between sensory processing sensitivity and tension-type headache. The aim of the present study was to examine the moderating role of pain catastrophizing in the relationship between sensory processing sensitivity and tension-type headache. The sample was selected from Islamabad and consisted of 324 adults (46 men, 278 women). 212 adults were diagnosed with tension-type headache) via a structured questionnaire using the ICHD-3 criteria, and 112 did not report such a health condition. The Highly Sensitive Person Scale was used to measure sensory processing sensitivity, and the Pain Catastrophizing scale was used to measure pain catastrophizing. The results show that tension-type headache was positively correlated with sensory processing sensitivity ( $r = 0.35, p < 0.01$ ), and this relationship was moderated by pain catastrophizing. This study sheds light on subtle factors contributing to headache disorders. It also informs clinical approaches, emphasizing the role of pain catastrophizing in the sensitivity-headache link, potentially guiding personalized interventions for improved headache management in individuals.*

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### Abstrak

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#### Kata kunci:

*pain  
catastrophizing;  
sensory processing  
sensitivity; tension-  
type headache*

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Hanya sedikit yang diketahui tentang hubungan antara sensitivitas pemrosesan sensorik dan *tension-type headache*. Tujuan dari penelitian ini adalah untuk menguji peran moderasi dari *pain catastrophizing* dalam hubungan antara sensitivitas pemrosesan sensorik dan *tension-type headache*. Sampel dipilih dari Islamabad dan terdiri dari 324 orang (46 laki-laki, 278 perempuan). 212 orang dewasa didiagnosis mengalami sakit kepala tipe tegang melalui kuesioner terstruktur dengan menggunakan kriteria ICHD-3, dan 112 orang tidak didiagnosis mengalami gangguan tersebut. *Highly Sensitive Person Scale* digunakan untuk mengukur sensitivitas pemrosesan sensorik, dan *Pain Catastrophizing Scale* digunakan untuk mengukur *pain catastrophizing*. Hasil penelitian menunjukkan bahwa *tension-type headache* berkorelasi positif dengan sensitivitas pemrosesan sensorik ( $r=0,35$ ,  $p<0,01$ ), dan hubungan ini dimoderasi oleh *pain catastrophizing*. Penelitian ini menyoroti faktor-faktor tersembunyi yang berkontribusi terhadap gangguan sakit kepala. Penelitian ini juga menginformasikan pendekatan klinis, yang menekankan peran *pain catastrophizing* dalam hubungan sensitivitas sensorik dan sakit kepala, yang berpotensi memandu intervensi yang personal untuk manajemen sakit kepala yang lebih baik pada individu.

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## INTRODUCTION

### *Background Of The Study*

Headache could be a symptom of neurological diseases such as a brain tumor, head or neck injury, cranial or cervical vascular disorder, non-vascular intracranial disorder, or any other neurological disorder. It could comprise a primary headache such as migraine, tension-type headache, or trigeminal autonomic cephalalgias (Olesen et al., 2013; Olesen, 2024).

Headache disorders are often underrecognized and undertreated (Caponnetto et al., 2021); however, they are in fact the second most common reason for disability globally (Saylor & Steiner, 2018). Due to the high number of incidences (1.89 billion), tension-type headaches (TTH) have more significant socioeconomic impacts than any other primary headache sub-type (Leonardi et al., 2021). Compared to migraines,

tension-type headaches cause more severe impairment and more missed workdays than migraines (Scripter, 2018).

The impact of tension-type headache is particularly pronounced in professional and educational settings, where the pain disrupts mental clarity, thus impairing cognitive performance. This headache-related decline in productivity and increased absenteeism not only affects individuals' behavior and quality of life but also carries a substantial economic impact (Goadsby et al., 2021).

Within the workplace context, headache disorders contribute to presenteeism, with a study in Europe showing that only half of individuals experiencing headaches while at work can complete their full workday (Monzani et al., 2018). Another study found that approximately 10% of people with tension-type headache miss multiple days of work annually due to their headaches (Suzuki et al., 2014).

Tension-type headache adversely affects various aspects of cognitive function, including concentration, attention, reading comprehension, processing speed, and memory (Smith, 2016). The cognitive impact and productivity loss may manifest in anxiety, avoidance behaviors, decreased social interactions, and lifestyle compromises reported by a significant portion of people experiencing tension-type headache (Lampl et al., 2016). Research indicates that tension-type headache can also impair psychomotor performance and diminish overall quality of life (Smith, 2016).

Some studies have found that psychological factors are related to tension-type headache (Kröner-Herwig & Gassmann, 2012; Aaseth et al., 2011; Kröner-Herwig, 2013; Lee et al., 2019; Freitag, 2013). One of the psychological traits considered to be associated with tension-type headache is sensory processing sensitivity (SPS). Sensory processing sensitivity is defined as a genetically determined trait that involves a more thorough cognitive processing of inputs driven by heightened emotional response (Aron et al., 2012). It is also described as a common, heritable, and evolutionarily conserved trait describing inter-individual differences in sensitivity to the environment (Greven et al., 2019). People with high sensory processing sensitivity are more emotionally reactive to different stimuli and situations. Everyone goes through stressful life situations, but highly sensitive people react stronger to those stimuli (Aron, 2011).

Although sensory processing sensitivity is considered a psychological trait (Jagiellowicz et al., 2011), some studies have found that it affects the neural system

(Acevedo et al., 2014). Sensory processing sensitivity alters how a person perceives their surroundings, making them more sensitive to both internal and external stimuli. This is because neurotransmitters in people who are highly sensitive target or activate distinct parts of the brain when processing information (Acevedo et al., 2014). Recent studies have investigated the association between sensory processing sensitivity and behavior, physiological reactions, and brain activation patterns (Aron et al. 2012). Participants' neural activity in response to others' emotional expressions concerning sensory processing sensitivity was observed in a study by Acevedo et al. (2014). The result indicated that the scores of highly sensitive people were correlated with an increase in brain activity in the cingulate, insula, premotor area, middle temporal gyrus, and inferior frontal gyrus regions. These findings suggest that sensory processing sensitivity is related to human brain function to some extent.

International Classification of Headache Disorders (ICHD)-3 has included tension-type headache in the subcategory of primary headaches (International Headache Society, 2018). Primary headaches are caused by problems with pain-sensitive structures within one's brain. This type of headache disorder considers the headache itself as an illness and is not attributed to any other disorder (Özge et al., 2011). Primary headache is considered to be one of the most disabling medical conditions in the general population (Vos et al., 2015). The most prevalent type of primary headache is tension-type headache (Arendt-Nielsen et al., 2016). Tension-type headache is defined as a bilateral headache with a pressing or tightening quality without a known medical cause (Ajimsha, 2011). Terms such as psychogenic headache, muscle tension headache, depressive headache, and interval headache are also used to describe tension-type headache (Freitag, 2013). The pain of a tension-type headache is band-like and non-pulsatile, and it could be mild or moderate in intensity (Safiri et al., 2022).

The etiology of tension-type headache is thought to be multifactorial, involving genetic and environmental factors (Scripter, 2018). Recent research suggests that the core cause of TTH resides in the autonomic nervous system (Yerdelen et al., 2007). Stress is widely demonstrated as a contributing factor in tension-type headache (Cathcart et al., 2010). Central mechanisms of tension-type headache may involve increased psychological response to pain (Cathcart et al., 2010). Some studies support the genetic origin of tension-type headache (Yu & Han, 2015; Russell, 2007; Van-Den-Maagdenberg

et al., 2010). However, environmental influences might carry greater importance than genetic factors in the development of tension-type headache (Ulrich et al., 2004).

One of the most significant psychological correlates of chronic pain and disability is the concept of pain catastrophizing (Petrini & Arendt-Nielsen, 2020). Catastrophizing pain may have an impact on the level of pain and distress experienced by chronic pain patients (Michael & Burns, 2004). Pain catastrophizing might be considered by many as a psychological phenomenon, but there is a connection between pain catastrophizing and brain areas tightly connected to pain perception and modulation (Galambos et al., 2019). The aim of including this construct in the study was to see whether pain catastrophizing is correlated with tension-type headache, such that there is a neurological tendency of the nervous system of the people who experience tension-type headache to catastrophize the pain of the headache they experience.

### *Literature Review*

To date, not much research has been done to explore the relationship between sensory processing sensitivity and tension-type headache. However, few researchers have studied constructs that correlate with sensory processing sensitivity and investigated their relationship with tension-type headache. For instance, the role of personality traits and psychological disorders has long been associated with tension-type headache (Freitag, 2013). Further sensory processing sensitivity is correlated with neuroticism in adults (Lionetti et al., 2019), similarly, neuroticism scores are highest for tension-type headache (Ashina et al., 2017). A study found that female participants having frequent episodic tension-type headache showed a higher nerve mechanical sensitivity (Caamaño-Barríos et al., 2019).

Highly sensitive people may catastrophize their bodily pain more than others. Catastrophizing pain plays a unique role in predicting pain intensity. Sensory processing patterns may be related to individual pain perception, as expressed in pain catastrophizing levels (Engel-Yeger & Dunn, 2011). Adolescents with episodic migraine appear to have extreme sensory processing patterns and increased pain catastrophizing (Genizi et al., 2020). Sensory processing patterns are associated with psychological variables of pain (Jung et al., 2013). Sensory sensitivity is found to be significantly correlated with higher levels of catastrophizing (Meredith et al., 2015).

The development of tension-type headache might be the result of common catastrophic thinking patterns about negative bodily sensations. Headache pain intensity is also affected by magnifying the cognitive consequences of somatic symptoms (Drahovzal et al., 2006). Pain catastrophizing independently predicts weekly headache (Drahovzal et al., 2006). In a study by Buenaver et al. (2008), higher catastrophizing was associated with greater headache pain and pain-related interference.

### ***Rationale Of The Study***

As the underlying cause of tension-type headache is uncertain (Loder & Rizzoli, 2008), this study can add information to the literature regarding the cause of tension-type headache. If the hypotheses are supported, sensory processing sensitivity might be known as one of the causes of tension-type headache. Knowing that being a highly sensitive person and having the tendency to catastrophize the pain can result in tension-type headache, can help psychologists and psychiatrists to create better intervention plans.

### ***Novelty Of The Study***

The uniqueness of this study lies in the diversity of the sample's age range, spanning from 17 to 70 years old. Unlike many studies in the field, which typically feature narrower age ranges such as 23 to 65 (Romero-Godoy et al., 2022), our research encompasses a broader spectrum of ages. Additionally, this study stands out for its focus on the Pakistani population, as no similar investigation has been undertaken in Pakistan before. Furthermore, this research delves into the association between blood groups and tension-type headache, presenting novel insights not previously explored in the literature.

### ***Research Gap***

Based on the literature review that has been carried out, research on sensory processing sensitivity in adults with and without tension-type headache moderated by pain catastrophizing has never been conducted in Pakistani society. Therefore, there is a population gap that needs to be followed up with research involving the Pakistani community.

### ***Purposes Of The Study***

The following are the objectives of the study: 1) to examine the relationship between sensory processing sensitivity and tension-type headache among adults; 2) to examine the role of sensory processing sensitivity as a predictor of tension-type

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headache among adults; 3) to explore the moderating role of pain catastrophizing in the relationship between sensory processing sensitivity and tension-type headache among adults; and 4) to explore the effect of demographics variables, such as age, gender, and blood group, about study constructs.

### ***Hypotheses Of The Study***

The hypotheses of the present study are as follows: 1) there is a positive correlation between sensory processing sensitivity and tension-type headache among adults; 2) tension-type headache has a positive correlation with pain catastrophizing; and 3) pain catastrophizing moderates the relationship between sensory processing sensitivity and tension-type headache.

## **METHODS**

### ***Research Design***

This study applied the correlational research design to explore associations between variables without manipulating them. This study examined the relationships between sensory processing sensitivity, pain catastrophizing, and tension-type headache, as well as exploring how gender, blood type, age, and family incidence influence the observed variables.

### ***Research Sample And Sampling Technique***

The sample comprised 324 adults (46 men, 278 women) of varying age groups. The age range of participants was 17 to 70 years. A convenient sampling technique was employed, selecting participants from easily accessible locations, such as a psychological clinic, universities, and workplaces. Initially targeting 300 participants, the study included additional responses obtained during the research, leading to the final sample size. Based on their responses to the questionnaires, participants were categorized into two groups: those with tension-type headache and those without. Of the participants, 212 reported experiencing tension-type headache, while 112 did not.

The study's inclusion criteria were: 1) *the absence of a history of major neurological disorders (e.g., migraines, epilepsy)*. Excluding participants with other major neurological disorders helps isolate the specific relationship between SPS, pain catastrophizing, and tension-type headache, minimizing confounding variables (Ashina et al., 2021); 2) *patients and their families understood the nature of this study and provided written informed*

*consent*. Obtaining written informed consent is a standard ethical practice in research. It ensures that participants are fully aware of the study's purpose, procedures, potential risks, and benefits, and voluntarily agree to participate (World Medical Association, 2013); 3) *aged 17 to 70*. Tension-type headache often affects individuals across various age groups, and this range ensures a broad representation of adults experiencing tension-type headaches (Rasmussen, 1993; Rasmussen, 2001; GBD 2016 Headache Collaborators, 2018). 4) *men and women living in Islamabad*. Regional variations in headache prevalence have been observed, and it's essential to consider potential cultural and environmental factors that might influence the relationship between sensory processing sensitivity and tension-type headache (Ayzenberg et al., 2012).

Participant exclusion criteria were as follows: 1) participants that have headache due to any physical injury, brain tumor, or any other medically proven brain disease that is known to be the cause of their headache; 2) children; 3) people living outside of Islamabad; 4) people with mental health disorders or serious physical language impairment.

### ***Operational Definitions***

Sensory processing sensitivity (SPS) is a common, inherited trait describing inter-individual differences in sensitivity to negative and positive environments (Greven et al., 2019). This variable was operationalized in terms of scores obtained on the Highly Sensitive Person scale (Aron & Aron, 1997).

Tension-type headache (TTH) is a neurological disorder characterized by a predisposition to mild to moderate headache attacks with few associated symptoms (Loder & Rizzoli, 2008). In this study, the health condition was diagnosed using a questionnaire based on the International Classification of Headache Disorders, 3<sup>rd</sup> edition (ICHD-3). Individuals fulfilling the diagnostic criteria on the tension-type headache questionnaire will be diagnosed as individuals having tension-type headaches.

Pain catastrophizing is conceptualized as a negative cognitive-affective response to anticipated or actual pain and has been associated with several important pain-related outcomes (Quartana et al., 2009). Pain catastrophizing was operationalized in terms of scores obtained from the Pain Catastrophizing Scale (Sullivan et al., 1995).



### *Instruments Of Measurement*

The demographic sheet comprised of gender, marital status, age, type of family structure (nuclear, joint), birth order, and blood group. The options for gender were male and female. Age range options were 17-30, 31-51, and 51-70. In the blood group section, participants were given the options of A+ and A-, B+, B-, AB+, AB-, O+, O-, and an option of “I don’t know my blood group”.

The Highly Sensitive Person Scale (HSPS) was initially conceived and validated through a series of studies aimed at investigating the personality construct of sensory processing sensitivity (SPS), as proposed by Aron and Aron in 1997. Comprising 27 items, the scale was originally designed to assess different facets of sensory processing sensitivity and was initially perceived as a unidimensional construct (Aron & Aron, 1997). However, subsequent research by Smolewska, McCabe, & Woody (2006) revealed that the HSPS is underpinned by three distinct factors: a) *aesthetic sensitivity* (AES), involving awareness of aesthetics in one's surroundings; 2) *low sensory threshold* (LST), representing an aversion to unpleasant sensory arousal; and 3) *the overwhelmingness caused by both external and internal demands*. HSPS has an internal consistency of 0.87 and a validity of 0.85 given by Cronbach’s  $\alpha = 0.83$  (Bas et al., 2021).

The Headache questionnaire was designed according to diagnostic criteria listed in the International Classification of Headache Disorders, 3<sup>rd</sup> version (ICHD-3). The questionnaire comprises 10 items related to the presence of headache, intensity, and duration of headache, location of headache, and some symptoms associated with tension-type headache according to the checklist provided in ICHD-3.

The Pain Catastrophizing Scale (PCS) consists of 13 items (5-point Likert-type scale). It assesses the extent of catastrophic thinking related to pain. The score ranges from 0 (not at all) to 4 (all the time). Principal Components Analysis revealed that the PCS assesses three interconnected dimensions: 1) *magnification*; which means assessment of pain as a threat, 2) *rumination*, or persistent worry, and 3) *helplessness*, which is belief in the ineffectiveness of pain resolution. In a study by Wheeler et al. (2019), the PCS exhibited good internal reliability (Cronbach’s  $\alpha = 0.92$ , 95% CI 0.91 - 0.93) and test-retest reliability (Spearman’s  $\rho = 0.88$ , 95% CI 0.83 - 0.93). Previous data on PCS reliability indicate satisfactory to excellent internal validity scores, including total PCS ( $\alpha = 0.87$  -

0.93), rumination ( $\alpha = 0.87- 0.91$ ), magnification ( $\alpha = 0.66 - 0.75$ ), and helplessness ( $\alpha = 0.78 - 0.87$ ) (Wheeler et al., 2019).

### ***Ethical Considerations***

The ethical review board of [Redacted] University, Islamabad, and the head of the department of psychology granted ethical approval for this research. The participants' consent was obtained through written forms, and they were assured about the privacy and confidentiality of the information they gave.

### ***Data Collection Technique***

Tension-type headache patients and individuals without such illness were approached by the researcher with the approval of the relevant authorities. The participants were first given a brief introduction to the survey and were asked about their willingness to participate in it. Those who agreed to participate were then given informed consent for their official approval. The survey was conducted using printed questionnaires and oral administration and guidance for filling those questionnaires.

First, participants were given the Headache Questionnaire, and the researcher explained each item. They were then asked to fill out the Highly Sensitive Person scale. Finally, the Pain Catastrophizing scale was administered. The information was then gathered, and any confusion regarding it was clarified. Additionally, participants were advised to answer honestly, and they were thanked for their assistance after completing their questionnaire responses.

### ***Data Analysis Technique***

First, frequencies and percentages of demographic variables were calculated to understand the study population and detect any biases. Data were then analyzed to summarize the central tendency, variability, and distribution of the measured variables. Next, a correlation matrix explored relationships between variables. Regression analysis assessed sensory processing sensitivity as a predictor of tension-type headache while examining the moderating effect of pain catastrophizing in this relationship. One-way ANOVA compared tension-type headache, sensory processing sensitivity, and pain catastrophizing across age groups to identify significant differences. Tukey's HSD post hoc test was conducted following significant findings. All analyses were performed using the Statistical Package for the Social Sciences (SPSS).

## RESULTS AND DISCUSSION

### Research Result

Table 1 represents the demographics of the study sample. The researcher grouped participants based on their sexes, age ranges, marital status, blood group, tension-type headache diagnosis, and family history of tension-type headache.

Table 1.  
Participants' Demographics (N=324)

Variables	Category	n	%
Sex	Male	46	14.2
	Female	278	85.8
Age	17-30	251	77.5
	31-50	41	12.7
	51-70	32	9.9
Marital Status	Single	196	60.5
	Married	110	34
	Engaged	18	5.6
Blood Group	A+	24	7.4
	A-	11	3.4
	B+	83	25.6
	AB+	16	4.9
	AB-	16	4.9
	O+	59	18.2
	O-	43	13.3
	Subjects did not know their blood group	72	22.2
TTH Diagnosis	With TTH	212	65.4
	Without TTH	112	34.6
Family members with TTH	Mother, Father, or sibling being diagnosed with TTH	153	47.2
	None of the family members suffer from TTH	171	52.8

Note. TTH = Tension-type Headache

Table 2 shows the psychometric properties of the scales used in the present study. The Cronbach's  $\alpha$  value for the Pain Catastrophizing Scale was 0.93, which indicated very high internal consistency. The Cronbach's  $\alpha$  value for the Highly Sensitive Person

Scale was 0.92, which also indicated very high internal consistency. The value of skewness (0.41 and -0.32) and kurtosis (-0.82 and -0.92) highlighted that data were distributed conventionally and skewed.

Table 2.

Pain Catastrophizing And Sensory Processing Sensitivity Data

Scales	$\alpha$	M (SD)	Ranges		Skewness	Kurtosis
			Hypothetical	Actual		
PCS	0.93	1.91 (94)	13-52	14-51	0.41	-0.82
HSPS	0.92	4.33 (1.08)	27-189	28-182	-0.32	-0.92

*Note.* PCS = Pain Catastrophizing Scale; HSPS = Highly Sensitive Person Scale

Table 3 revealed that tension-type headache has a significant positive correlation with sensory processing sensitivity ( $r = 0.35, p < 0.01$ ) and pain catastrophizing ( $r = 0.27, p < 0.01$ ), respectively. Sensory processing sensitivity has a significant positive correlation with pain catastrophizing ( $r = 0.51, p < 0.01$ ).

Table 3.

Correlation Matrix Of Observed Variables

Variables	TTH	HSPS	PCS
TTH	-	0.35**	0.27**
HSPS	-	-	0.51**
PCS	-	-	-

*Note.* \*\* $p < .01$

TTH = Tension-type Headache; PCS = Pain Catastrophizing Scale; HSPS = Highly Sensitive Person Scale

Table 4 shows the impact of sensory processing sensitivity on tension-type headache in adults. The findings revealed that sensory processing sensitivity positively predicted tension-type headache ( $0.35, p < 0.01$ ). The  $R^2$  value of 0.12 revealed that sensory processing sensitivity explained a 12% variance in tension-type headache ( $F(1, 322) = 45.41, p < 0.01$ ).

Table 4.

Regression Analysis Summary For Sensory Processing Sensitivity As Predictor Of Tension-Type Headache

Variables	B	95% CI	$\beta$	t	p
Constant	1.98	[1.78, 2.19]		19.32	0.000
HSPS	0.16	[0.11, 0.2]	0.35	6.74	0.000

*Note.*  $R^2 = 0.12$

\*\*\* $p < 0.01$ .

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Table 5 indicates that the main effect of SPS on TTH is non-significant. Moreover, the main effect of pain catastrophizing on TTH is also non-significant. The interaction term between SPS and pain catastrophizing is significant. Figure 1 displays the relationship between research variables.

Table 5.

Moderating Effect Of Pain Catastrophizing In Relationship Between Sensory Processing Sensitivity And Tension-Type Headache

Predictors	$\beta$	SE	TTH		
			<i>t</i>	<i>p</i>	95% CI
Constant	-0.041	1.18	-0.03	0.97	[-2.35, 2.27]
HSPS	0.01	0.29	0.04	0.97	[-0.56, 0.58]
PCS	-1.28	0.74	-1.73	0.08	[-2.73, 0.17]
HSPS*PCS	0.37	0.17	0.17	0.02*	[0.04, 0.69]

Note. \* $p < 0.05$

TTH = Tension-type Headache; PCS = Pain Catastrophizing Scale; HSPS = Highly Sensitive Person Scale

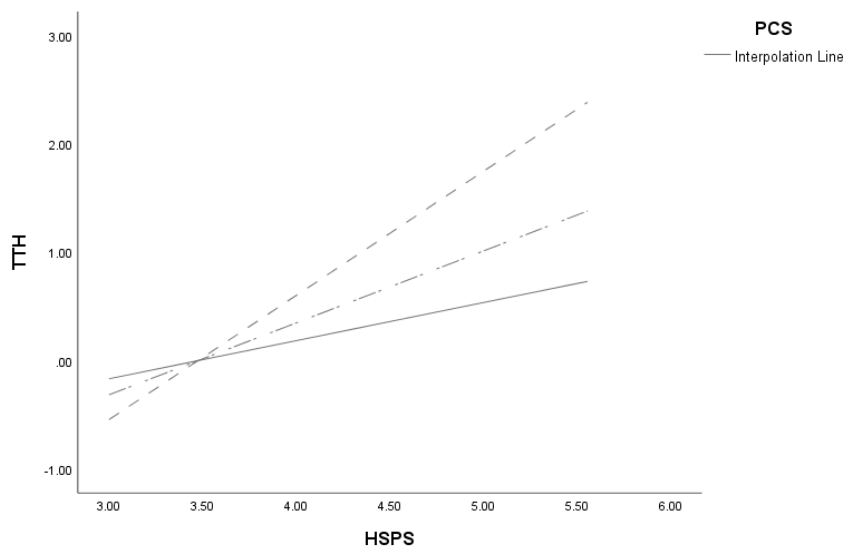


Figure 1. Pain Catastrophizing Moderates Relationship Between Sensory Processing Sensitivity And Tension-Type Headache

Table 6 revealed significant mean differences in sensory processing sensitivity in people with or without tension-type headache ( $t(322) = -6.74, p < 0.01$ ). Findings showed that individuals with tension-type headache exhibited higher scores on sensory processing sensitivity ( $M = 4.6, SD = 1.03$ ) compared to individuals without tension-type headache ( $M = 3.81, SD = 0.99$ ). Findings also revealed a significant mean difference in *Sensory Processing Sensitivity In Adults With And Without Tension-Type Headache: Moderating Role Of Pain Catastrophizing*

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pain catastrophizing between people with or without tension-type headache ( $t(322) = -5.02, p < 0.01$ ). Findings showed that individuals with tension-type headache exhibited higher scores on pain catastrophizing ( $M = 2.09, SD = 0.89$ ) compared to those without ( $M = 1.56, SD = 0.92$ ).

Table 6.

Difference In Sensory Processing Sensitivity And Pain Catastrophizing Between People With And Without Tension-Type Headache

	With TTH ( $n=212$ )	Without TTH ( $n=112$ )			
Variables	$M (SD)$	$M (SD)$	$t(322)$	$p$	Cohen's $d$
HSPS	4.6 (1.03)	3.81 (0.99)	-6.74	0.000	0.78
PCS	2.09 (0.89)	1.56 (0.92)	-5.02	0.000	0.59

Note. \*\*\* $p < 0.01$

TTH = Tension-type Headache; PCS = Pain Catastrophizing Scale; HSPS = Highly Sensitive Person Scale

Table 7 showed non-significant mean differences in sensory processing sensitivity between men and women ( $t(322) = -6.74, p > 0.05$ ). Findings also revealed a non-significant mean difference on the pain catastrophizing scale with ( $t(322) = -5.02, p > 0.05$ ).

Table 7.

Difference In Sensory Processing Sensitivity And Pain Catastrophizing Between Men And Women

	Male ( $n=46$ )	Female ( $n=278$ )			
Variables	$M (SD)$	$M (SD)$	$t(322)$	$p$	Cohen's $d$
HSPS	4.3 (1.15)	4.33 (1.07)	-6.74	.92	0.03
PCS	2.15 (.92)	1.67 (.94)	-5.02	.06	0.52

Note.  $p > 0.05$

TTH = Tension-type Headache; PCS = Pain Catastrophizing Scale; HSPS = Highly Sensitive Person Scale

Table 8 revealed non-significant mean differences in tension-type headache based on a family history of such health condition ( $t(315) = -0.26, p > 0.05$ ). On the other hand, findings revealed a significant mean difference in sensory processing sensitivity ( $t(315) = 7.61, p < 0.01$ ) and pain catastrophizing ( $t(315) = 8.04, p < 0.01$ ) based on a family history of tension-type headache.



Table 8.

Tension-Type Headache, Sensory Processing Sensitivity, And Pain Catastrophizing  
Based On Family Health History

	Mother, Father, or siblings having high TTH scores (n=119)	Mother, Father, or siblings having low TTH scores (n=198)			
Variables	M (SD)	M (SD)	t (315)	p	Cohen's d
TTH	2.65 (.48)	2.66 (0.47)	-0.26	0.79	0.02
HSPS	4.87 (.86)	3.99 (1.07)	7.61	0.000	0.91
PCS	2.38 (.96)	1.59 (.77)	8.04	0.000	0.91

Note. \*\*\* $p < .001$   
TTH = Tension-type Headache; PCS = Pain Catastrophizing Scale; HSPS = Highly Sensitive Person Scale

Table 9 showed that the tension-type headache ( $F(2, 321)=2.84, p>0.05$ ) and sensory processing sensitivity ( $F(2, 321)=1.69, p>0.05$ ) across age groups did not vary significantly. However, there was a significant difference in pain catastrophizing scores between age groups ( $F(2, 321)=0.12, p<0.05$ ).

Table 9.

Tension-Type Headache, Sensory Processing Sensitivity, And Pain Catastrophizing  
Based On Age Groups

	Young Adults (n=251)		Middle Adults (n=41)		Old Adults (n=32)			
Variables	M	SD	M	SD	M	SD	F	p
TTH	2.67	0.47	2.71	0.46	2.47	0.51	2.84	0.06
HSPS	4.32	1.06	4.57	0.99	4.11	1.32	1.69	0.19
PCS	1.83	0.93	2.08	0.85	2.26	1.05	3.78	0.02

Note. \* $p < 0.05$   
TTH = Tension-type Headache; PCS = Pain Catastrophizing Scale; HSPS = Highly Sensitive Person Scale

The results of the analysis (Table 10) showed tension-type headache ( $F(4, 319)=10.8, p<0.01$ ) and pain catastrophizing scores ( $F(4, 319)=22.4, p<0.01$ ). varied significantly among blood groups. Meanwhile, sensory processing sensitivity scores among blood groups did not vary significantly ( $F(4, 319)=3.74, p>0.05$ ).

Table 10.

Tension-Type Headache, Sensory Processing Sensitivity, And Pain Catastrophizing  
Based On Blood Groups

Variables	Blood Group A+/A- (n=35)		Blood Group B+/B- (n=83)		Blood Group AB+/AB- (n=32)		Blood Group O+/O- (n=102)		F	p
	M	SD	M	SD	M	SD	M	SD		
TTH	2.46	0.51	2.48	0.51	3	0.000	2.67	0.48	10.8	0.000
HSPS	3.89	0.79	4.23	1.16	4.44	1.31	1.12	0.11	3.74	0.137
PCS	1.49	0.88	1.45	0.55	1.34	0.49	2.37	1.03	22.4	0.000

Note. \*\*\* $p < 0.01$

TTH = Tension-type Headache; PCS = Pain Catastrophizing Scale; HSPS = Highly Sensitive Person Scale

Table 11 indicates a significant difference among different blood groups in the diagnosis of tension-type headache. Individuals from blood group AB+/AB- scored higher on the tension-type headache questionnaire.

Table 11.

Tukey's Honest Significant Differences (HSD) Test On Tension-Type Headache

I (Group)	J (Group)	Mean Difference				
		(I-J)	SE	P	LL	UL
A+/A-	B+/B-	-0.39	0.214	0.373	-0.97	0.20
	AB+/AB-	-0.55	0.26	0.217	-1.26	0.16
	O+/O-	-0.35	0.21	0.454	-0.92	0.22
B+/B-	A+/A-	0.39	0.21	0.373	-0.20	0.97
	AB+/AB-	-0.16	0.22	0.948	-0.77	0.44
	O+/O-	-0.18*	0.066	0.045	-0.37	0.00
AB+/AB-	A+/A-	0.54*	0.110	0.000	0.24	0.84
	B+/B-	0.52*	0.094	0.000	0.26	0.77
	O+/O-	0.33*	0.091	0.003	0.08	0.58
O+/O-	A+/A-	0.21	0.088	0.124	-0.03	0.45
	B+/B-	0.18*	0.066	0.045	0.00	0.37
	AB+/AB-	-0.33*	0.091	0.003	-0.58	-0.08

Note. \* $p < 0.05$

Table 12 indicates a significant difference among people from different blood groups in terms of pain catastrophizing. Individuals having blood group O+/O- score higher on the pain catastrophizing scale.

Table 12.

## Tukey's Honest Significant Differences (HSD) Test On Pain Catastrophizing

		Mean Difference				
I (Group)	J (Group)	(I-J)	SE	P	LL	UL
A+/A-	B+/B-	0.04	0.17	0.999	-0.42	0.49
	AB+/AB-	0.15	0.20	0.950	-0.41	0.71
	O+/O-	-0.88*	0.16	0.000	-1.33	-0.43
B+/B-	A+/A-	-0.04	0.17	0.999	-0.49	0.42
	AB+/AB-	0.11	0.17	0.968	-0.36	0.59
	O+/O-	-0.92*	0.12	0.000	-1.26	-0.58
AB+/AB-	A+/A-	-0.15	0.20	0.950	-0.71	0.41
	B+/B-	-0.11	0.17	0.968	-0.59	0.36
	O+/O-	-1.03*	0.17	0.000	-1.49	-0.57
O+/O-	A+/A-	0.88*	0.16	0.000	0.43	1.33
	B+/B-	0.92*	0.12	0.000	0.58	1.26
	AB+/AB-	1.03*	0.17	0.000	0.57	1.49

Note. \* $p < 0.05$

**Discussion**

The present study sought to resolve the complex relationship between sensory processing sensitivity (SPS), pain catastrophizing, and tension-type headache (TTH). This study aligns with the broader research landscape that has delved into the correlation between tension-type headache and constructs associated with sensory processing sensitivity, as highlighted in studies by [Ashina et al. \(2017\)](#) and [Song et al. \(2016\)](#). Despite these efforts, a notable gap exists in the literature, as direct exploration of the relationship between sensory processing sensitivity and tension-type headache remains limited. This study aimed to address this gap, providing a more comprehensive understanding of the nuanced connections between these variables.

Demographic patterns in headache disorders have been a focal point in previous research ([Wöber et al., 2018](#)). The remarkable overrepresentation of women in the current study resonates with existing literature suggesting a higher prevalence of tension-type headache in women ([Stovner et al., 2007](#)). This demographic distribution introduces a layer of complexity to the understanding of tension-type headache across different age groups and marital statuses, necessitating a deeper examination of these factors in explaining possible underlying mechanisms.

The psychometric properties of the Pain Catastrophizing and Highly Sensitive Person scales, demonstrated by high Cronbach's  $\alpha$  values, are in line with the reliability

reported in similar studies (Sullivan et al., 1995; Bas et al., 2021). These strong measures underpin the subsequent analyses, enhancing the credibility of the study's findings and providing a solid foundation for interpretations.

The positive correlation between tension-type headache and sensory processing sensitivity aligns with existing literature, as indicated by Price et al. (2021). However, the unexpected positive correlation between tension-type headache and pain catastrophizing contradicts some studies that have positioned pain catastrophizing as an independent predictor of headache (Drahovzal et al., 2006; Buenaver et al., 2008). This inconsistency underscores the complex nature of the relationship between psychological factors and tension-type headache, necessitating further investigation into the underlying mechanisms to reconcile these divergent findings.

The regression analysis revealing that sensory processing sensitivity positively predicts tension-type headache supports the findings of Price et al. (2021), reinforcing the argument for a direct link between these variables. The revelation of non-significant main effects of sensory processing sensitivity and pain catastrophizing on tension-type headache, coupled with a significant interaction term, introduces complexity to the understanding of these relationships. This complexity underscores the need for more sophisticated models and methodologies to solve the complexity of how sensory processing sensitivity and pain catastrophizing contribute to tension-type headache.

The study's findings regarding mean differences and effect sizes align with existing research indicating a substantial impact of sensory processing sensitivity and pain catastrophizing on headache severity (Turner et al., 2007; Pielsticker et al., 2005). However, the lack of significant variation in tension-type headache scores with age contradicts findings by Starling (2018), emphasizing the necessity for continued exploration into age-related factors influencing tension-type headache.

The novel association between blood group AB+/AB- and higher tension-type headache scores introduces a unique and unexplored avenue for investigation. The link between blood groups and headache disorders has not been extensively studied, making this finding particularly intriguing and potentially transformative in understanding the physiological underpinnings of tension-type headache. Integrating recent studies that explore similar physiological associations with headache disorders emphasizes the importance of further research in this direction.

The observation that individuals with a family history of tension-type headache exhibit higher sensory processing sensitivity and pain catastrophizing aligns with the broader literature on the interplay between genetic and environmental factors in headache disorders (Gibson et al., 2019; Waung et al., 2020). This emphasizes the significance of considering both genetic and environmental factors for a comprehensive understanding of tension-type headache. Additionally, incorporating recent studies that delve into the genetic basis of headache disorders could further substantiate this aspect of the discussion.

In conclusion, this study contributes valuable insights into the complex relationship between sensory processing sensitivity, pain catastrophizing, and tension-type headache. The unique association between the blood group and tension-type headache, while not supported by existing literature, can potentially reshape our understanding of the physiological factors contributing to tension-type headache. Continued exploration of genetic factors and their role in headache disorders is crucial for a comprehensive understanding of tension-type headache (Waung et al., 2020).

Expanding the discussion further, recent studies by Milde-Busch et al. (2011) and Cathcart et al. (2010) provide additional perspectives on the relationship between psychological factors and tension-type headache. A study by Koechlin et al. (2023) suggests that individuals with high sensory processing sensitivity may exhibit heightened neural responses to pain, leading to increased pain catastrophizing and, consequently, a higher likelihood of experiencing tension-type headache. It is essential to acknowledge the evolving nature of scientific inquiry, and continuous exploration is necessary to further refine and expand our understanding of the relationships between sensory processing sensitivity, pain catastrophizing, and tension-type headache.

### **Limitations**

The data for the present study was collected only from Islamabad. This limited variation in the demographic characteristics of our sample could create bias. It is suggested that future studies improve generalizability by taking samples from all over Pakistan and other countries.

The number of male participants ( $n=46$ ) was significantly less than that of female participants ( $n=278$ ), which potentially introduces a bias to our results, especially with regard to gender-based comparisons. In future studies, more male samples could be included.

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The analysis based on blood groups might contain bias as not all the participants knew their blood groups. In future studies, researchers can select the sample based on their knowledge of their blood groups.

## **CONCLUSIONS AND SUGGESTIONS**

### ***Conclusions***

This research has examined the relationship between sensory processing sensitivity and tension-type headache. Based on quantitative analysis, it could be concluded that there is a significant positive correlation between tension-type headache and sensory processing sensitivity. Pain catastrophizing moderates the relationship between tension-type headache and sensory processing sensitivity. Results accentuate a significant difference in scores of patients with and without tension-type headache. This study adds information to the literature about tension-type headache, and the possible factors resulting in their occurrence.

### ***Suggestions***

Further studies can be conducted on the psychological causes of tension-type headache and perhaps, the psychological treatment of tension-type headache. Psychologists, psychiatrists, practitioners, and individuals in academia might be able to use this research as a point of reference for identifying, understanding, and overcoming problems related to chronic headaches and related psychological disorders. Psychologists should aim to spread awareness about psychological causes of tension-type headache and the possible ways to control pain via psychotherapy techniques.

Neurologists and neurosurgeons should also consider the psychological triggers of such types of chronic headache and refer the patients to psychologists after diagnosis.

Another significance of this study is that it investigates the relationship between blood group and TTH. Researchers could investigate further about this relationship further in more detailed studies. As little information is available in the literature regarding the correlation of tension-type headache with sensory processing sensitivity, this finding is a great help for future researchers who want to further investigate about the possible psychological causes of tension-type headache.



**AUTHOR CONTRIBUTION STATEMENT**

**Yasmeen Zahra:** Conceptualization; Data Curation; Formal Analysis; Investigation; Methodology; Project Administration; Resources; Validation; Visualization; Writing Original Draft; Writing, Review & Editing

**Nazia Iqbal:** Project Administration; Writing, Review & Editing; Supervising The Project

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