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27 Frequent tension-type headache sufferers exhibit widespread pain sensitivity across pressure and thermal pain modalities

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Introduction

Chronic tension-type headache (CTTH) has been hypothesized to arise from a central pain processing deficit. Research has found that individuals with frequent TTH and CTTH exhibit increased pericranial muscle tenderness[1,2] and reduced cephalic pressure pain thresholds (PPTs),[3–5] possibly implicating sensitization at the trigeminal nucleus. However, CTTH sufferers have also been found to exhibit reduced extracephalic PPTs in some studies,[3–5] suggesting a higher order deficit in pain processing. The purpose of this study was to examine pressure and thermal pain sensitivity in frequent TTH and CTTH at both cephalic and extracephalic locations.

Subjects and methods

Subjects

Eighty-three females were recruited in a two-stage screening process. Only females were recruited to eliminate confounding gender differences in psychophysiological measures. In the first stage, 706 female college students completed an online questionnaire that inquired about the subject's headache symptoms and headache history. Females who appeared to meet IHS criteria for TTH on the basis of their questionnaire responses and who reported at least eight headaches per month (TTH),

and females who reported fewer than 12 non-problem headaches per year (healthy controls) were scheduled for a structured diagnostic interview in order to obtain additional information about the individual's headaches and a formal headache diagnosis. Only females who met IHS criteria for frequent TTH or CTTH during the structured diagnostic interview were included. Participants were also excluded if they experienced more than one migraine (IHS 1.1, 1.2) per month, a headache disorder other than TTH (e.g. cluster headache, medication overuse headache; IHS 3.1, 8.2), reported any significant health problem (e.g. hypertension, diabetes) or acute injury severe enough to warrant medical attention in the previous 6 months, or used prescription pain medications or prophylactic headache medications.

Twenty-eight ($n = 28$) TTH sufferers met the International Headache Society (IHS; Headache Classification Subcommittee of the International Headache Society, 2004) diagnostic criteria for frequent episodic TTH (IHS 2.2; $n = 19$; mean age = 19.16) or CTTH (IHS 2.3; $n = 9$, mean age = 19.33). Healthy controls ($n = 55$; mean age = 18.5) reported fewer than 12 non-problematic headaches per year. Prior to the assessments, subjects were given oral and written descriptions of the procedures and informed consent was obtained.

Methods

Pericranial muscle tenderness (PMT), Manual Tender Point Survey (MTPS), pressure-pain thresholds at the temporalis and finger, and heat and cold pain thresholds at the temporalis and forearm were used to assess cephalic and extracephalic pain sensitivity.

PMT was assessed in five bilateral pericranial muscles (temporalis, masseter, suboccipital, posterior cervical, and middle trapezius), which were palpated with the tip of the right index finger, using a standardized fingertip pressure of 500 g/cm as measured by an electronic palpometer (Innovation & Development Corp.). Tenderness was recorded by the examiner on a scale from 0 to 3 (0 = no visible reaction and denial of tenderness; 1 = no visible reaction but verbal report of mild pain; 2 = verbal report of moderate pain, facial expression of discomfort or no facial reaction; 3 = marked grimacing or withdrawal, verbal report of moderate or severe pain). The sum of the ratings for the 10 muscles was used as the PMT score, giving the PMT score a range of 0–30.

The MPTS was assessed in nine bilateral survey points (occiput, trapezius, supraspinatus, gluteal, low cervical, second rib, lateral epicondyle, greater trocanter, and knee). Pressure was applied perpendicularly at 4 kg/s using a dolorimeter (Chatillon Inc., Kew Gardens, NY, USA). Subjects rated each palpation on a 0 (no pain, just pressure) to 10 (most intense pain imaginable) scale, and the ratings for the 18 muscles are summed, giving the MTPS a range of 0–180. In addition, the number of sites reported at a pain rating of two or higher was summed to create a total number of positive tender sites.

PPT were assessed at bilateral temporalis and finger sites. Pressure was applied at 1.0 kg/s using a hand-held dolorimeter (Pain Diagnostics & Thermography, Inc.), and participants verbally indicated when the pressure first becomes painful.

Heat and cold pain thresholds were assessed at the temporalis and lateral forearm using a computerized (Medoc, Ltd.) device that increases/decreases the temperature of a 30 × 30 mm probe at a rate of 0.3°C. Participants identified when the increase (heat) or decrease (cold) in temperature first became painful.

Results

It can be seen from Table 27.1 that TTH sufferers reported higher PMT scores compared with healthy controls ($P < 0.001$). TTH sufferers exhibited lower PPTs at both cephalic (temporalis; $P < 0.01$) and at extracephalic (finger; $P < 0.001$) sites.

The TTH group also exhibited greater whole body muscle tenderness on the Manual Tender Point Survey (median = 25.0) compared with controls (median = 12.0, $P < 0.001$) and exhibited tenderness at more muscle sites (median = 8.0 positive tender points) compared with controls (median = 4.0 positive tender points; $P < 0.001$). As Table 27.2 shows, these differences were evident at both cephalic and extra-cephalic sites ($Ps < 0.001$).

As Table 27.3 shows, TTH sufferers exhibited lower heat–pain thresholds than controls at both the temporalis ($P < 0.001$) and lateral forearm ($P< 0.001$), and also exhibited higher cold pain thresholds (greater cold sensitivity) at both the temporalis ($P < 0.05$) and lateral forearm ($P < 0.05$).

Conclusions

In young females with frequent (≥8 days per month) TTHs, both cephalic and extracephalic pain sensitivity was increased across multiple modalities of pain stimuli. Sensitization solely at the level of the trigeminal nucleus could explain increased cephalic pain sensitivity; however, the widespread pain sensitivity observed here suggests a more generalized disruption in pain processing/modulation.

Table 27.1 Pericranial muscle tenderness scores and pressure pain thresholds (medians and percentiles) in tension-type headache sufferers and healthy controls

	TTH			Healthy controls		
	Median	25th	75th	Median	25th	75th
PMT scores**	2.25	(0.00)	(6.75)	0.00	(0.00)	(2.00)
PPT scores (kg/s)						
Temporalis*	2.79	(2.54)	(3.50)	3.71	(3.08)	(4.29)
Finger**	5.17	(4.51)	(6.16)	6.58	(5.46)	(7.92)

*$P < 0.01$; **$P < 0.001$.

Table 27.2 Total tenderness scores and number of tender muscles on the Manual Tender Point Survey in tension-type headache sufferers and healthy controls

	TTH			Healthy controls		
	Median	25th	75th	Median	25th	75th
MTPS Scores						
Cephalic**	12.00	(10.25)	(14.75)	6.00	(4.00)	(10.00)
Extra-cephalic**	14.00	(10.00)	(17.00)	5.00	(2.00)	(10.00)
Number of tender muscle groups						
Cephalic**	3.00	(3.00)	(3.00)	2.00	(1.00)	(3.00)
Extra-cephalic**	5.00	(3.25)	(6.00)	2.00	(1.00)	(3.00)

**$P < 0.001$.

Table 27.3 Mean heat- and cold-pain thresholds at cephalic (temporalis) and extra-cephalic (lateral forearm) sites in tension-type headache sufferers and healthy controls

	Tension-type headache		Healthy controls	
	Mean	SD	Mean	SD
Heat-pain (°C)				
Temporalis**	41.50	(4.34)	45.30	(4.31)
Forearm**	38.11	(3.05)	41.36	(4.29)
Cold-pain (°C) †				
Temporalis*	22.23	(8.12)	17.29	(10.11)
Forearm*	21.96	(7.73)	17.56	(9.69)

*$P < 0.001$; **$P < 0.05$; †Higher temperatures indicate greater sensitivity to cold stimuli.

This suggests that the central pain processing deficit in TTH extends beyond the trigeminal nucleus, likely involving higher-order deficits in pain processing/modulation.

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