

Measuring temperature differences at neck points and their relationship with jaw and neck function in adults with cervical spondylosis and temporomandibular disorders

Submission date 02/07/2026	Recruitment status No longer recruiting	☐ Prospectively registered ☐ Protocol
Registration date 03/07/2026	Overall study status Completed	☐ Statistical analysis plan ☐ Results
Last Edited 03/07/2026	Condition category Digestive System	☐ Individual participant data ☒ Record updated in last year

Plain English summary of protocol

Background and study aims

Temporomandibular disorders are conditions that affect the jaw joint, chewing muscles, and related structures. They can cause jaw pain, limited mouth opening, and difficulty with daily oral activities. These disorders may also be related to neck problems, especially in people with cervical spondylosis. Skin temperature differences between the left and right sides in the neck region may reflect changes in local blood flow, muscle activity, or nerve regulation. This study aims to test the measurement properties of a designed infrared thermometer, ATHERM, and to examine whether temperature differences at selected neck acupoints are related to jaw and neck function.

Who can participate?

Adults aged 18 years and older can participate. The first part of the study includes healthy adults without neck or jaw pain. The second part includes adults with cervical spondylosis who also meet diagnostic criteria for temporomandibular disorders.

What does the study involve?

In the first part, healthy adults have their temperature measured at selected points on the back of the head and neck using ATHERM, FLIR C5 thermal camera, and Microlife FR1MF1 infrared thermometer. In the second part, patients with cervical spondylosis and temporomandibular disorders have temperature measured using ATHERM. They also complete pain and function questionnaires, have jaw movement measured with a ruler, and have neck movement measured using the ROMIX photogrammetric system.

What are the possible benefits and risks of participating?

Participants may not receive direct personal benefit from taking part. However, the findings may help improve objective assessment of jaw and neck function in people with temporomandibular

disorders. The procedures are non-invasive and expected to involve minimal risk. Some participants may feel mild temporary discomfort when performing maximal jaw or neck movements.

Where is the study run from?

Ho Chi Minh City Hospital for Rehabilitation – Occupational Diseases, Vietnam.

When is the study starting and how long is it expected to run for?

November 2023 to May 2025.

Who is funding the study?

The Korea International Cooperation Agency under the Education and Research Capacity Building Project at University of Medicine and Pharmacy at Ho Chi Minh City.

Who is the main contact?

Dr Minh Nguyen Huu Duc, nhdminh@ump.edu.vn

Contact information

Type(s)

Public, Scientific, Principal investigator

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Study information

Scientific Title

Correlation between point-specific thermal asymmetry and cervico-mandibular function in patients with cervical spondylosis and temporomandibular disorders: A clinimetric and cross-sectional correlation study using ATHERM infrared thermometer

Study objectives

(1) to evaluate the measurement properties of ATHERM, an infrared thermometer designed for point-specific temperature assessment at Fengchi (GB20) and Fengfu (GV16), and (2) to explore whether GB20 thermal asymmetry is associated with pain, neck disability, jaw functional

limitation, jaw range of motion, and cervical range of motion in patients with cervical spondylosis and temporomandibular disorders

Ethics approval required

Ethics approval required

Ethics approval(s)

1. Approved 01/11/2023, Ethics Committee of Ho Chi Minh City Hospital for Rehabilitation – Occupational Diseases (313 Au Duong Lan Street, Chanh Hung Ward, Ho Chi Minh City, 700000, Viet Nam; +84 2838569147; bvphcn.syt@tphcm.gov.vn), ref: 18/HDDD-BVPHCN-DTBNN
2. Approved 01/05/2024, Ethics Committee of Ho Chi Minh City Hospital for Rehabilitation – Occupational Diseases (313 Au Duong Lan Street, Chanh Hung Ward, Ho Chi Minh City, 700000, Viet Nam; +84 2838569147; bvphcn.syt@tphcm.gov.vn), ref: 10/HDDD-BVPHCN-DTBNN
3. Approved 01/08/2024, Ethics Committee of Ho Chi Minh City Hospital for Rehabilitation – Occupational Diseases (313 Au Duong Lan Street, Chanh Hung Ward, Ho Chi Minh City, 700000, Viet Nam; +84 2838569147; bvphcn.syt@tphcm.gov.vn), ref: 12/HDDD-BVPHCN-DTBNN

Primary study design

Observational

Secondary study design

Cross sectional study

Study type(s)

Health condition(s) or problem(s) studied

Measurement properties of ATHERM infrared thermometer; correlation of thermal asymmetry at acupuncture points with cervico-mandibular dysfunction

Interventions

This is a two-phase cross-sectional observational study. In the clinimetric phase, 50 asymptomatic adults underwent ATHERM temperature measurements at bilateral Fengchi (GB20) and Fengfu (GV16) to evaluate test-retest reliability, measurement error, and construct validity. ATHERM measurements were compared with those obtained from a FLIR C5 thermal camera and a Microlife FR1MF1 non-contact infrared thermometer. Each participant underwent three measurement sessions with 5-minute intervals under standardized environmental conditions.

In the clinical correlation phase, baseline data were obtained from patients with cervical spondylosis before randomization and before initiation of pharmacological treatment or cervical exercise intervention in another randomized study. Patients were further screened for temporomandibular disorders, and 73 eligible patients were included in the final analysis. ATHERM was used to measure temperature at bilateral GB20 and GV16, and side-to-side thermal asymmetry at GB20 was calculated as the absolute difference between left and right GB20 temperatures. Clinical outcomes included pain intensity using the Visual Analog Scale, neck-related disability using the Neck Disability Index, jaw functional limitation using the Jaw Functional Limitation Scale-8, maximal unassisted mouth opening measured with a calibrated ruler, and active cervical range of motion measured using the ROMIX photogrammetric system.

Associations between thermal asymmetry and clinical outcomes were examined using correlation analysis, with exploratory stratification according to a 0.5°C thermal asymmetry threshold.

Intervention Type

Other

Primary outcome(s)

1. Test-retest reliability and construct validity of ATHERM measured using intraclass correlation coefficient ICC(2,1) and Pearson correlation coefficients comparing ATHERM readings with FLIR C5 thermal camera and Microlife FR1MF1 infrared thermometer at three repeated measurements separated by 5-minute intervals
2. Association between GB20 thermal asymmetry and cervico-mandibular clinical outcomes measured using Spearman's rho between absolute difference between left and right GB20 temperatures with pain intensity, neck disability, jaw functional limitation, jaw range of motion, and active cervical range of motion at baseline before treatment and exercise in a cohort with cervical spondylosis and temporomandibular disorders

Key secondary outcome(s)

1. Pain intensity measured using 100-mm Visual Analog Scale, from "no pain" to "worst imaginable pain" at baseline
2. Neck-related disability measured using the Neck Disability Index at baseline
3. Jaw functional limitation measured using the Jaw Functional Limitation Scale-8 at baseline
4. Jaw range of motion measured using a calibrated mechanical ruler to assess the maximal unassisted mouth opening in millimeters at baseline
5. Active cervical range of motion measured using ROMIX photogrammetric system in six directions (flexion, extension, right bending, left bending, right rotation, and left rotation) at baseline

Completion date

31/05/2025

Eligibility

Key inclusion criteria

1. Participants were 18 years or older, regardless of sex, living area, and occupational background
2. For clinimetric study of ATHERM, asymptomatic adults were selected from institutional invitations and screened through medical history and cervical disability questionnaire, with inclusion criteria requiring:
 - 2.1. Absence of subjective neck or orofacial pain with VAS pain score of 0 and NDI score of ≤ 4
 - 2.2. Full cognitive and behavioral capacity to engage in occupational and routine activities
3. For correlation analysis, participants were identified from outpatients diagnosed with cervical spondylosis according to at least one of the following characteristic signs:
 - 3.1. Nonspecific cervical spine symptoms, such as axial neck pain, paraspinal muscular tightness, or limited mobility
 - 3.2. Radicular symptoms including arm discomfort, paresthesia, or symptom provocation on

cervical movement

3.3. Vertebrogenic symptoms such as occipital headache, postural dizziness, tinnitus, or visual disturbance associated with neck posture. Cervical X-ray radiographs showing degeneration at Kellgren-Lawrence grade 1 or 2 were mandatory, and magnetic resonance imaging (MRI) was obtained if necessary to affirm nerve root involvement or exclude alternative structural pathology. Eligible patients were further screened for temporomandibular disorders (TMD), and only those meeting the Diagnostic Criteria for Temporomandibular Disorders, were included in the analysis.

Healthy volunteers allowed

Yes

Age group

Adult

Lower age limit

18 Years

Upper age limit

60 Years

Sex

All

Total final enrolment

123

Key exclusion criteria

1. For clinimetric study of ATHERM, exclusion criteria comprised
 - 1.1. Recent or ongoing neck, shoulder, or head symptoms within the preceding three months
 - 1.2. Prior diagnosis of cervical spine or temporomandibular joint disorders
 - 1.3. History of surgery involving cervical or maxillofacial regions
 - 1.4. Systemic, neurological, or rheumatologic conditions
 - 1.5. Clinical signs of nerve root compression or cervical radiculopathy
2. For correlation analysis, exclusion criteria were
 - 2.1. Clinical signs of cervical myelopathy
 - 2.2. Cervical disc herniation on MRI
 - 2.3. Secondary causes of neck pain, including trauma, neoplasm, infection, osteoporosis, inflammatory arthropathy, or soft-tissue disorders
 - 2.4. Current pregnancy or breastfeeding
 - 2.5. Surgical treatment of cervical spine
 - 2.6. Severe hepatic dysfunction
 - 2.7. Renal failure without dialysis
 - 2.8. Recent or ongoing gastrointestinal or intracranial hemorrhage, or systemic bleeding disorders
 - 2.9. Uncontrolled severe cardiovascular diseases

Date of first enrolment

01/11/2023

Date of final enrolment

31/05/2025

Locations

Countries of recruitment

Viet Nam

Sponsor information

Organisation

University of Medicine and Pharmacy at Ho Chi Minh City

ROR

<https://ror.org/025kb2624>

Organisation

Ho Chi Minh City Hospital for Rehabilitation – Occupational Diseases

Funder(s)

Funder type

Funder Name

Korea International Cooperation Agency

Alternative Name(s)

KOICA

Funding Body Type

Government organisation

Funding Body Subtype

National government

Location

Korea, South

Results and Publications

Individual participant data (IPD) sharing plan

The datasets used and/or analysed during the current study are available from the corresponding author, Minh Nguyen Huu Duc, nhdminh@ump.edu.vn, on reasonable request

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet			02/07/2026	No	Yes