

DETERMINING THE ABILITY TO ACCURATELY ASSESS TEMPERATURE DIFFERENCES BY PALPATION: INVESTIGATION OF EXPERIENCED MANUAL THERAPISTS AND LAY INDIVIDUALS

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Purpose and Hypothesis

- Purpose: to evaluate the ability of manual physical therapists and lay persons to detect skin temperature differences through palpation
- Research Hypothesis:
 - Manual physical therapists and lay individuals will successfully identify temperature differences ranging from 3-5°C
 - Manual physical therapists will more accurately detect temperature differences ranging from 1-2°C

Rationale

- PTs rely on palpation to identify pathology.
- Palpation of skin temperature has not yet been proven accurate.
- Can palpation be utilized to solicit temperature variation that may be indicative of infection or inflammation?

Literature Review

- Palpation by mothers¹⁰⁻¹³
 - Sensitivity=73.9%-100%
 - Specificity=76%-92.2%
 - Body sites=forehead, abdomen, face, neck, back, and arms

Literature Review

- Normal skin temperature differences throughout the body

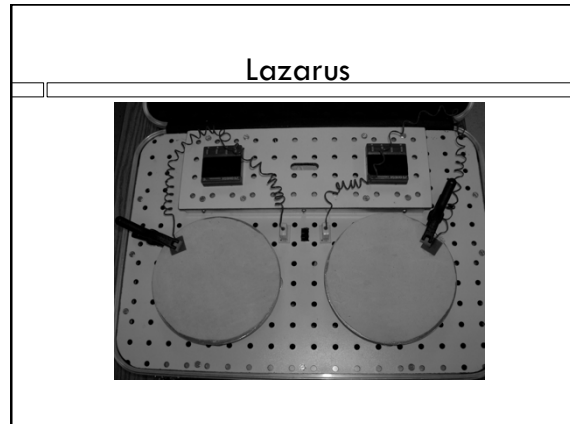
Body Part	Celsius	Fahrenheit
Middle Finger ¹⁸	31.25	88.25
Forearm ¹⁷	32-33	89.6-91.4
Paraspinals ¹⁶	30-35.4	86-95.7
Knee ¹⁹	29.5	85.1

Literature Review

- Manual palpation⁴:
 - Similar study design
 - 11 healthy physicians
 - 5 randomly arranged steel cylinders, carefully graded to produce equal 2°C, 4°C, and 6°C temperature gradients
 - Physicians correctly identified temperature gradients 1.00 ± 0.89 out of 10 trials
 - Human hand can not objectively discriminate subtle differences in skin temperature.

Methods

- **Inclusion Criteria:**
 - > **Clinicians:**
 - Licensed PTs
 - Utilize manual approach to PT
 - > 1 yr. experience
 - > **Lay Individuals:**
 - No prior palpation experience
- **Exclusion Criteria:**
 - > Minors
 - > Individuals with prior hx of hand fx/sx
 - > Individuals with dx of skin hypersensitivity disorder
 - > Sensory deficit
 - > Neuropathy
 - > Circulatory Insufficiency
 - > DM
 - > Clinicians from prior studies



Study Design

- Randomized, double blinded study
- Protocol:
 - 5 temperature differences ranging from 1°C to 5°C
 - Actual temperature range: 30-35°C
 - Each temperature difference is tested twice
 - 10 trials/participant

Temperature Gradients

Randomized Test Protocol

Pad 1	Temperature Difference	Pad 2
30°C	5°C (9°F)	35°C
34°C	3°C (5.2°F)	31°C
31°C	1°C (2°F)	32°C
32°C	2°C (3.2°F)	34°C
33°C	1°C (1.5°F)	32°C
34°C	4°C (7.2°F)	30°C
31°C	3°C (5.2°F)	34°C
35°C	5°C (9°F)	30°C
34°C	4°C (7.2°F)	30°C
35°C	2°C (3.5°F)	33°C

10 conditions (2 at each temperature difference)

Procedure

- 20 minute acclimation period
- Participants palpate using palmar surface of dominant hand
- 10 seconds per trial
- Participant indicates pad perceived to be warmer

Statistical Analysis

- Responses scored as true or false and entered into excel spreadsheet
- Analyzed using Chi-squared test
- Statistical significance: $p \leq 0.05$
- Multi-year study and data were combined with previous years to improve the power

Results for Manual Therapists

	Trials 1,8 (5°)	Trials 6,9 (4°)	Trials 2,7 (3°)	Trials 4,10 (2°)	Trials 3,5 (1°)
Correct	86	87	87	67	68
Incorrect	2	1	1	21	20
Chi square	80.18	84.05	84.05	24.05	26.18
Probability	0.00000	0.00000	0.00000	0.00000	0.00000

Results for Lay Individuals

	Trials 1,8 (5°)	Trials 6,9 (4°)	Trials 2,7 (3°)	Trials 4,10 (2°)	Trials 3,5 (1°)
Correct	87	81	75	62	55
Incorrect	1	7	13	26	33
Chi square	84.05	62.23	43.68	14.73	5.50
Probability	0.00000	0.00000	0.00000	0.00012	0.01902

Combined Results

	Trials 1,8 (5°)	Trials 6,9 (4°)	Trials 2,7 (3°)	Trials 4,10 (2°)	Trials 3,5 (1°)
Manual Therapists	86/88	87/88	87/88	67/88	68/88
Lay Individuals	87/88	81/88	75/88	62/88	55/88

Discussion

Pathologic Condition	Mean Temperature of Unaffected Extremity	Mean Temperature of Affected Extremity	Mean Difference Affected vs Unaffected
CHARCOT ARTHROPATHY²¹	27.9°C (82.22°F)	32.4°C (90.32°F)	4.5°C (8.10°F)
	Overall mean	Overall mean	Overall mean
Tarsometatarsal Joint²¹	28.0°C (82.4°F)	32.8°C (91.04°F)	4.8°C (8.64°F)
Transverse Tarsal Joint²¹	27.5°C (81.5°F)	32.0°C (89.6°F)	4.5°C (8.10°F)
Ankle Joint²¹	28.3°C (82.94°F)	32.3°C (90.14°F)	5.0°C (9.0°F)
NEUROPATHIC JOINT²¹	28.7°C (83.66°F)	31.8°C (89.24°F)	3.1°C (5.58°F)
	Overall mean	Overall mean	Overall mean
Hallux²¹	28.8°C (83.84°F)	30.6°C (87.08°F)	1.8°C (3.24°F)
1st Metatarsal²¹	28.8°C (83.84°F)	31.8°C (89.24°F)	3.0°C (5.40°F)
2nd-4th Metatarsals²¹	28.6°C (83.48°F)	32.5°C (90.5°F)	1.4°C (2.54°F)
5th Metatarsal²¹	28.7°C (83.66°F)	32.3°C (90.14°F)	3.9°C (7.02°F)
POLYNEUROPATHY²²	33.1°C (91.58°F)	31.8°C (89.24°F)	1.3°C (2.34°F)

- ### Implications
- Palpation matters
 - Literature indicates temperature changes with pathological joints
 - Our results indicate that manual therapists can detect subtle temperature differences
 - Practice develops skill
 - Likely relationship between time spent touching the patient and correctly assessing temperature changes

- ### Limitations
- Lazarus temperature fluctuations
 - Age
 - Temperature changes with hand temperature
 - Control over room temperature
 - Lack of instructions on sanitizing hands after bathroom use
 - Multiple research groups conducting the same study

Future Research

- Comparing palpation sensitivity between
 - Health care professionals
 - Gender
- Comparing palpation sensitivity difference based on
 - Years of experience
 - Percentage of time spent using manual therapy
 - Palpation technique

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