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Is Oral Temperature an Accurate Measurement of Deep Body Temperature? A Systematic Review

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Context: Oral temperature might not be a valid method to assess core body temperature. However, many clinicians, including athletic trainers, use it rather than criterion standard methods, such as rectal thermometry.

Objective: To critically evaluate original research addressing the validity of using oral temperature as a measurement of core body temperature during periods of rest and changing core temperature.

Data Sources: In July 2010, we searched the electronic databases PubMed, Scopus, Cumulative Index to Nursing and Allied Health Literature (CINAHL), SPORTDiscus, Academic Search Premier, and the Cochrane Library for the following concepts: *core body temperature, oral,* and *thermometers.* Controlled vocabulary was used, when available, as well as key words and variations of those key words. The search was limited to articles focusing on temperature readings and studies involving human participants.

Data Synthesis: Original research was reviewed using the Physiotherapy Evidence Database (PEDro). Sixteen studies met the inclusion criteria and subsequently were evaluated by 2 independent reviewers. All 16 were included in the review because they met the minimal PEDro score of 4 points (of 10 possible points), with all but 2 scoring 5 points. A critical review of these studies indicated a disparity between oral and criterion standard temperature methods (eg, rectal and esophageal) specifically as the temperature increased. The difference was –0.50°C ± 0.31°C at rest and –0.58°C ± 0.75°C during a nonsteady state.

Conclusions: Evidence suggests that, regardless of whether the assessment is recorded at rest or during periods of changing core temperature, oral temperature is an unsuitable diagnostic tool for determining body temperature because many measures demonstrated differences greater than the predetermined validity threshold of 0.27°C (0.5°F). In addition, the differences were greatest at the highest rectal temperatures. Oral temperature cannot accurately reflect core body temperature, probably because it is influenced by factors such as ambient air temperature, probe placement, and ingestion of fluids. Any reliance on oral temperature in an emergency, such as exertional heat stroke, might grossly underestimate temperature and delay proper diagnosis and treatment.

Key Words: exertional heat stroke, hyperthermia, core temperature

Key Points

- Oral temperature devices do not provide accurate measurements.
- Rectal temperature devices are suitable for core body temperature assessment.

Common body sites used to assess core body temperature include the mouth, auditory canal, temporal artery, axilla, rectum, esophagus, and gastrointestinal tract (via ingestible thermistors).[1–3] Oral, aural, temporal, and axillary assessments of temperature provide the clinician and patient with quick, noninvasive estimates of body temperature,[1–3] whereas esophageal and rectal assessment of temperature are less practical and more invasive despite their accuracy[1,2] and endorsement by several medical professional agencies, such as the American College of Sports Medicine (ACSM)[4] and National Athletic Trainers' Association (NATA).[5] Although they are a valid measure of core body temperature, ingestible thermistors do not always allow for a practical, acute assessment of core body temperature.[1] The sensor takes time to pass into the intestinal tract, limiting its use to planned, controlled assessments of core body temperature.

Many injuries and illnesses (eg, exertional heat stroke [EHS], appendicitis, heat exhaustion, exertional sickling) warrant an immediate and accurate assessment of core body temperature for a proper diagnosis and for appropriate treatment. In some cases, the measurement is used to differentiate EHS from other heat-related illnesses, such as heat exhaustion.[4,5] To provide an initial temperature assessment, many medical professionals use devices that measure temperature at the mouth, auditory canal, or axilla because they are practical, easy to use, and noninvasive instead of using devices that measure temperature at validated or recommended body sites.[6,7]

Although their efficacy in measuring core body temperature is debated,[1–3] oral temperature measurements are popular in many clinical settings.[1–3,6–13] In 2 recent studies,[6,7] we attempted to identify the preferences of high school and college athletic trainers

(ATs) for using different core body temperature sites. In addition, we tried to identify the rationale for their choices in clinical practice when assessing the magnitude of exercise-induced hyperthermia. Based on these investigations, we found that ATs prefer to use oral temperature as a method of core body temperature assessment when evaluating athletes whom they suspect have hyperthermia or EHS.[6,7] The surveyed ATs recognized rectal temperature as the criterion standard and as the body site recommended by the NATA for assessment; however, many cited its impracticality, their lack of training, and invasiveness as reasons not to use this method.[6] This finding is alarming considering that an accurate measurement of core body temperature is essential for determining proper treatment. Unfortunately, many EHS cases are undiagnosed and inappropriately treated initially because of the use of inaccurate temperature sites, such as the mouth, auditory canal, and axilla.[14,15] With the continued incidence of EHS and the emergence of exertional sickling as a cause of sudden death, ATs and other medical professionals must be aware of the proper way to assess elevated core body temperature to make a correct diagnosis and proper treatment selection because these conditions have distinctly opposing treatment protocols.

In several clinical trials, researchers[1–3,8–15] have compared rectal and oral temperatures in both resting and exercising participants. The results were unfavorable for the use of oral temperature as an accurate measurement of core body temperature. Despite these scientific findings, many medical professionals continue to prefer and use oral temperature for body temperature measurement, particularly in the athletic training setting.[6,7] The continued use of oral temperature in the clinical setting may be based on scientific evidence; however, a systematic review allows the congregate analysis of all peer-reviewed articles on the subject, strengthening the consensus about whether oral temperature is a valid measure of core body temperature. Therefore, the purpose of our systematic review was to assess the existing evidence about the validity of using oral temperature to measure core body temperature at periods of rest and changing body temperature. Specifically, we sought to examine whether oral temperature accurately tracked core body temperature during exercise and water immersion. We recognize that oral temperature assessment devices have been presented within the medical community as inaccurate measurement devices and that this information has been published widely in the medical and athletic training literature.[4,5] However, many medical care providers, particularly ATs, continue to use oral temperature and in some cases use it instead of rectal temperature for core body temperature assessment.[6,7] By providing a synthesis of all scientific evidence related to the efficacy of oral temperature assessment devices, we hope to decrease the use of the devices in lieu of accurate measurement devices, such as a rectal temperature device.

METHODS

Data Sources

We searched the following electronic databases with no date limits or language limits: PubMed, Scopus, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), SPORTDiscus, Academic Search Premier, and the Cochrane Library, which includes the Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects (DARE), Cochrane Central Register of Controlled Trials, Cochrane Methodology Register, Health Technology Assessment Database, and National Health Service Economic Evaluation Database. These databases were searched in July 2010 using the following search criteria: *core body temperature, oral,* and *thermometers*. Previously known cases, review articles, and reference lists were cross-referenced for possible inclusion. Controlled vocabulary was used, when available, as well as key words and variations of those key words. To focus the database search, we restricted the search to include research articles in which authors directly compared body sites for the measures of body temperature and in which human participants were studied. Articles were excluded from data analysis if they were editorials, practice guidelines, or reviews. Specific inclusion criteria identified before data analysis included comparison of core body temperature with a criterion standard temperature body site (ie, rectal, esophageal, pulmonary, or gastrointestinal sites),[4,5] measurements taken at rest or during exercise, measurements taken after cold- or warm-water immersion, and oral temperature measurement with a mercury or digital thermometer. We excluded articles if the Physiotherapy Evidence Database (PEDro) score was less than 4 or if the authors did not use a criterion standard assessment device or did not document data.

Quality Assessment

A total of 16 of 119 research articles met our inclusion criterion (Figure 1). Two of the articles were considered 2 separate comparisons because each compared 2 oral temperature devices (inexpensive and expensive); therefore, we examined 18 core body temperature comparisons. Using the PEDro scale,[16] 2 reviewers (S.M.M., M.S.G.) independently assessed the methodologic quality of these studies. The scale is useful in evaluating the quality of the study, specifically its validity, sufficiency of data, and clinical usefulness. A score of 4/10 was established for an article to be included in data analysis because blinding of the participants and therapists is impossible when core body temperature is being assessed. Therefore, the maximum score was 6/10. Seven of the full-length publications identified were written in a foreign language (Danish = 6, French = 1). Therefore, 2 additional reviewers (J.K., J.V.), who were fluent in these languages and had knowledge of PEDro scale scores, assessed the quality of the studies using the PEDro scale.

Data Analysis

To evaluate the effectiveness of assessing oral temperature at various body temperatures, oral measurements were subtracted from the reference measurement (ie, taken at a rectal, esophageal, pulmonary, or gastrointestinal site). The relationship between the temperature measured by the criterion standard and the difference between the oral and criterion standard temperatures was measured with a Pearson product moment correlation.[17] Furthermore, a clinical level of acceptance for the difference between oral and criterion standard temperatures was set at 0.27°C (0.5°F).

RESULTS

Data Synthesis

The PEDro scores for the 16 studies ranged from 4 to 5 points. Any initial discrepancies between reviewers were discussed, and consensus was reached on all PEDro scores ($\kappa = 1.00$) for the 11 comparisons in English-language publications. All studies meeting the inclusion criteria met our crite-

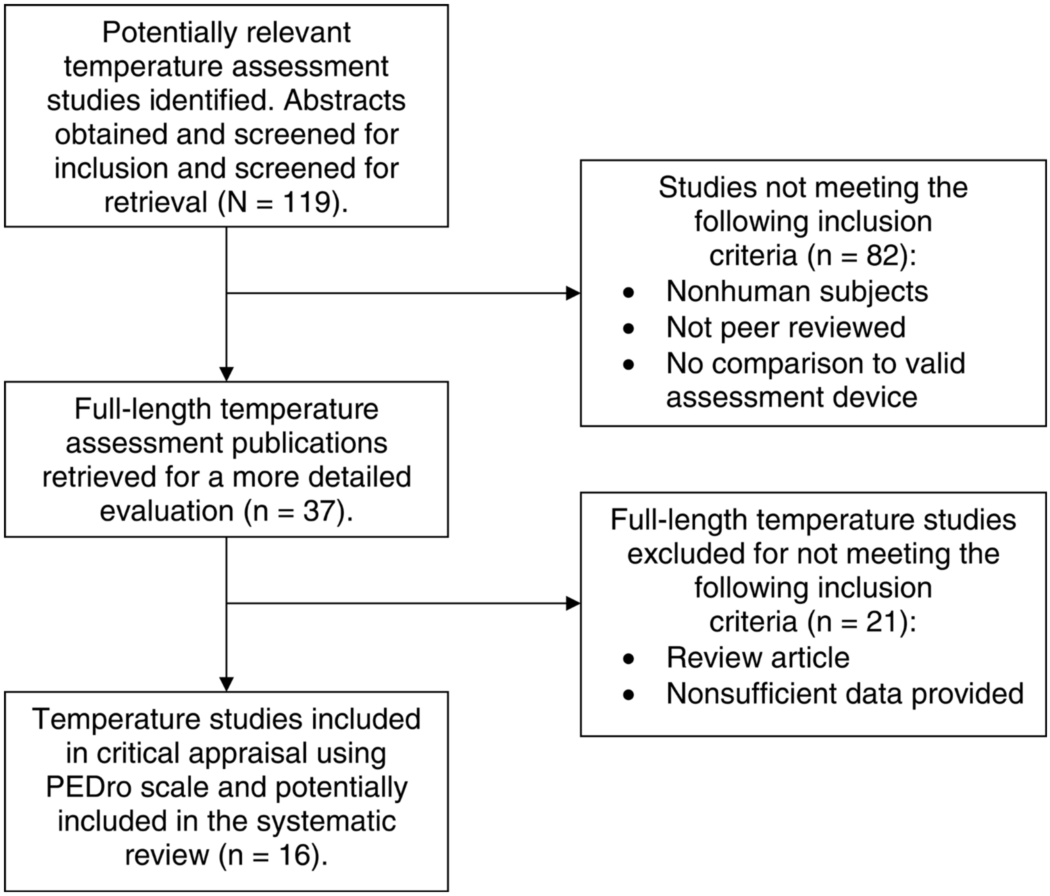

Figure 1. Selection process for articles included for the systematic review. Abbreviation: PEDro, Physiotherapy Evidence Database.

rion score of 4/10, with all but 2 receiving a final PEDro score of 5 (Tables 1–3).

Two major protocols emerged during review, including measurements taken during rest and nonsteady state body temperature (at exercise or immersion at various ambient temperatures). The overall results and methodologic procedures are presented in Tables 1–3. Independent of experimental condition, oral temperature underestimated the criterion standard temperature measurement by 0.60°C±0.51°C. We found an inverse correlation between temperature measured by the criterion standard and the difference between the oral and criterion standard temperatures (r=–0.77, P<.001). As core temperature increased, the difference between oral and criterion standard temperature measurements increased (Figure 2). Furthermore, 73% of the comparisons were greater than the acceptable level of difference (0.27°C [0.5°F]).

Rest

At rest, the average difference between oral temperature and the criterion standard temperature was –0.50°C±0.31°C (eg, rectal=37°C [98.6°F], whereas oral=36.48°C [97.66°F]) (Figure 3). A summary of each research protocol is provided next. In the resting methodologic protocols, researchers recorded core body temperature in participants who were considered at rest or in a steady state. The purpose of the investigations was to determine whether oral temperature devices were suitable for assessing core body temperature in lieu of rectal temperature devices. Authors of 8 of the 9 studies refuted the accuracy of oral temperature devices and strongly encouraged clinics, hospitals, and other medical facilities to use rectal thermometry instead of oral temperature assessment.

When comparing rectal and oral (electric) temperature assessment devices for measuring temperature in hospital patients, Jensen et al[1] found that the difference between the 2 devices was more than 1°C. Two other investigations of rectal and oral temperature assessments by Jensen et al[9,18] produced similar results. Steen[8] found similar discrepancies between the devices, reporting that the average difference ranged from 1.2°C to 3.0°C. Among hospitalized patients, Gote et al[10] found that the difference between rectal and oral temperature assessments was 0.8°C when an electric oral temperature device was used.

Nonsteady-State Body Temperature

When body temperature was changing, the average difference between oral and criterion standard temperatures was –0.58°C±0.75°C (eg, rectal=39°C [102.2°F], whereas oral =38.42°C [101.16°F]) (Figure 4). We discuss each protocol.

Exercise. In the exercise protocol, the researchers used a predetermined length of exercise time to increase core body temperature and recorded temperature readings at rest or baseline, during exercise, and after exercise. A breakdown of each study with calculated mean differences is provided in Tables 1–3.

One of the earliest investigations of core body temperature using active hyperthermia for measurement was conducted by Haight and Keatinge.[19] The researchers were concerned with

Table 1. Studies Comparing Temperature Assessment Devices During Rest

Study	No. of Participants	Participant Characteristics	Protocol and Environment	Comparison Device (Criterion Standard)	Body Temperature Differences (Oral – Criterion Standard), °C	PEDro Score
Steen,[8] 1990	55	Patients admitted to hospital	At rest	Rectal	–0.60	5
Jensen et al,[18] 1989	184	Patients admitted to hospital	At rest	Rectal	–0.70	5
Jensen et al,[9] 1991	91	Patients admitted to hospital	At rest	Rectal	0.75	5
Jensen et al,[1] 2000[a]	200 (98 female, 102 male)	Patients admitted to hospital without fever	At rest without eating	Rectal	0.43	5
Jensen et al,[1] 2000[a]	85	Patients admitted to hospital with fever (37.5°C)	At rest without eating or drinking 30 min before measurement	Rectal	–0.58	5
Hansen,[12] 1991	266	Patients admitted to hospital	At rest	Rectal	–1.00	4
Couilliet et al,[13] 1996	224	Patients admitted to hospital	At rest	Rectal	–0.49	5
Nielsen and Bakholdt,[11] 1991	147	Patients admitted to hospital	At rest	Rectal	–0.23	5
Gote et al,[10] 1989	95	Patients admitted to hospital	At rest	Rectal	–0.75	4
Casa et al,[14] 2007[b]	25 (15 men, 10 women)	Healthy, physically active (≥2 workouts ≥4 h/wk)	At rest before exercising in the heat	Rectal Gastrointestinal	–0.30 –0.39	5
			At rest postexercise	Rectal Gastrointestinal	–0.85 –0.68	
Casa et al,[14] 2007[c]	25 (15 men, 10 women	Healthy, physically active (≥2 workouts ≥4 h/wk)	At rest before exercising in the heat	Rectal Gastrointestinal	–0.90 –0.99	5
			At rest postexercise	Rectal Gastrointestinal	–1.24 –1.07	
Ganio et al,[15] 2009[b]	25 (15 men, 10 women)	Healthy, physically active (≥2 workouts ≥4 h/wk)	At rest before exercising in the heat	Rectal Gastrointestinal	–0.58 –0.79	5
			At rest postexercise	Rectal Gastrointestinal	–1.01 –0.85	
Ganio et al,[15] 2009[c]	25 (15 men, 10 women)	Healthy, physically active (≥2 workouts ≥4 h/wk)	At rest before exercising in the heat	Rectal Gastrointestinal	–0.85 –1.06	5
			At rest postexercise	Rectal Gastrointestinal	–1.26 –1.10	
Doyle et al,[3] 1992	20 (10 men, 10 women)	Healthy	At rest before hot or cold exposure	Rectal	–0.80	5
Edwards et al,[2] 1978	12 (6 men, 6 women)	Healthy	Before water immersion	Esophageal Rectal	–0.26 –0.14	5
			Before exercise	Esophageal Rectal	–0.35 –0.345	

Abbreviation: PEDro, Physiotherapy Evidence Database.
[a] Indicates same research study but authors divided patient population into 2 categories (fever and nonfever).
[b] Indicates investigators used an expensive oral temperature device (digital thermometer).
[c] Indicates investigators used an inexpensive oral temperature device (digital thermometer).

examining the effect of prolonged exercise on deep body temperature at rest. They demonstrated that oral temperature devices recorded lower readings than rectal temperature devices, and the average difference was –0.41°C.

Edwards et al[2] observed temperature differences between oral and esophageal temperature assessments and between oral and rectal temperature assessments. Those differences ranged from –0.14°C to –0.39°C; however, statistical analysis was not performed.

Casa et al[14] showed that oral temperature devices (inexpensive and expensive models) recorded lower readings than rectal temperature devices (–1.85°C) and ingestible thermistor pills (–1.55°C) during exercise ($P < .001$). The mean bias increased to –2.35°C (–4.23°F) and –3.00°C (–5.40°F) for the expensive and inexpensive oral devices, respectively, when compared with the 8 highest rectal temperatures at the 60-minute point of exercise. Similarly, Ganio et al[15] investigated temperature assessment devices in participants exercising in a laboratory environmental chamber and reported that temperature readings recorded with oral devices were lower than those recorded by rectal devices (–1.0°C) and ingestible thermistor pills (–1.03°C) during exercise ($P < .001$).

Table 2. Studies Comparing Temperature Assessment Devices During Exercise

Study	No. of Participants	Participant Characteristics	Protocol and Environment	Comparison Device (Criterion Standard)	Body Temperature Differences (Oral – Criterion Standard), °C	PEDro Score
Casa et al,[14] 2007[a]	25 (15 men, 10 women)	Healthy, physically active (≥2 workouts ≥4 h/wk)	Exercising in the heat (180 min team athletics, 29.4°C ± 1.4°C)	Rectal Gastrointestinal	−1.85 −1.55	5
Casa et al,[14] 2007[b]	25 (15 men, 10 women)	Healthy, physically active (≥2 workouts ≥4 h/wk)	Exercising in the heat (180 min team athletics, 29.4°C ± 1.4°C)	Rectal Gastrointestinal	−2.35 −2.05	5
Ganio et al,[15] 2009[a]	25 (15 men, 10 women)	Healthy, physically active (≥2 workouts ≥4 h/wk)	Exercising in heat chamber (90 min treadmill walking, 36.4°C ± 1.2°C)	Rectal Gastrointestinal	−1.00 −1.10	5
Ganio et al,[15] 2009[b]	25 (15 men, 10 women)	Healthy, physically active (≥2 workouts ≥4 h/wk)	Exercising in heat chamber (90 min treadmill walking, 36.4°C ± 1.2°C)	Rectal Gastrointestinal	−1.3 −1.3	5
Edwards et al,[2] 1978	12 (6 men, 6 women)	Healthy	Cycle ergometer (24°C ± 0.5°C), 2 10-min bursts (100 W men, 75 W women	Rectal Esophageal	−0.25 −0.34	5
Haight and Keatinge,[19] 1973	9 (men)	Healthy with previous hiking experience	Prolonged exercise (37 km hiking or walking)	Rectal	−0.41	5

Abbreviation: PEDro, Physiotherapy Evidence Database.

[a] Indicates investigators used an expensive oral temperature device (digital thermometer).

[b] Indicates investigators used an inexpensive oral temperature device (digital thermometer).

Table 3. Studies Comparing Temperature Assessment Devices During Immersion at Various Ambient Temperatures

Study	No. of Participants	Participant Characteristics	Protocol and Environment	Comparison Device (Criterion Standard)	Body Temperature Differences (Oral – Criterion Standard), °C	PEDro Score
Edwards et al,[2] 1978	12 (6 men, 6 women)	Healthy	Water immersion to neck (41.0°C ± 0.5°C) until increase of 0.5°C noted	Rectal Esophageal	−0.59 −0.06	5
Haight and Keatinge[19] 1973	9 (men)	Healthy with previous hiking experience	Water immersion (range, 40°C–43°C) until sweating was induced	Rectal	−0.13	5
McCaffrey et al,[20] 1975	5	Healthy	Water immersion (42°C for 1 h)	Rectal Esophageal	−0.11	5
Livingstone et al,[21] 1983	5 (men)	Healthy	Cold exposure sitting 90 min (range, 24°C–26°C)	Rectal Esophageal Radio pill	−0.70 −0.20 −0.60	5
Doyle et al,[3] 1992	20 (10 men, 10 women)	Healthy	15-min exposure to hot (43.5°C) 15-min exposure to cold (–5°C) temperatures	Rectal Rectal	−0.50 −0.70	5

Abbreviation: PEDro, Physiotherapy Evidence Database.

Passive Exposure to Environmental Extremes. McCaffrey et al[20] reported rapid temperature changes in oral temperature recordings compared with esophageal readings after water immersion and localized heating of the head. This finding highlights the strong influence head and skin temperature have on oral temperature assessment.

Water immersion or exposure to environmental changes at various ambient temperatures has been used to evaluate the influence of environmental factors on assessment of core body temperature. Edwards et al[2] immersed participants in a heated bath (41°C ± 0.5°C) just below the neck while recording rectal, oral, and esophageal temperatures. During immersion, the difference between rectal and oral temperature assessment was –0.51°C, whereas before and after immersion it was 0.26°C and 0.59°C, respectively.

Haight and Keatinge[19] found rectal temperature recordings were higher than oral temperature recordings after immersing their participants in warm (range, 40°C–43°C) water. McCaffrey et al[20] also used an immersion protocol to examine the effect of skin temperature on the accuracy of oral temperature

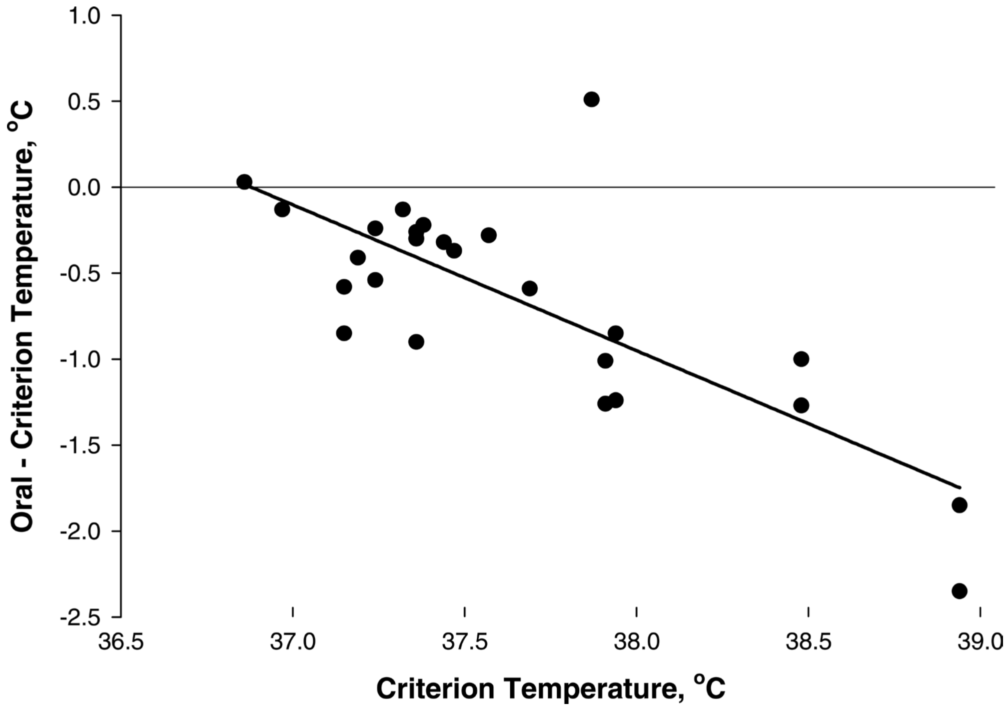

Figure 2. Correlation between difference in oral and criterion temperatures (Y-axis) versus criterion temperature (X-axis). As criterion temperature increased, measurements of oral temperature increasingly underestimated criterion temperature ($r = -0.77$, $P < .001$).

assessment devices. They reported that oral temperature was influenced disproportionately by heating the head and was an inaccurate estimate of core body temperature.

Doyle et al[3] were concerned with the effect of ambient temperature on oral temperature. They monitored temperatures after a 15-minute exposure to both hot (43.5°C) and cold (–5°C) environments and reported changes in oral temperature recordings (–0.5°C and –0.7°C, respectively) compared with those recorded rectally ($F = 9.338$, $P = .001$ and $F = 10.055$, $P = .001$, respectively). In addition, oral temperature recordings appeared to have great variability during data collection. Rectal temperature readings were not influenced by the environmental change.

Livingstone et al[21] investigated the influence of environmental conditions on several commonly used sites, including oral and rectal. Like Doyle et al,[3] the researchers found that when participants were exposed to the cold (–24°C to –26°C), rectal temperature recordings were independent of environmental changes when compared with oral temperature assessment. They hypothesized that the inhaling of cooled air influenced oral temperature.

DISCUSSION

Our primary conclusion is that oral temperature assessment consistently provides inaccurate prediction of core body temperature during rest and exercise. Our synopsis showed that oral temperature underestimated the criterion standard temperature measurement by 0.60°C ± 0.51°C, regardless of condition (nonsteady state versus rest). Most alarming from a sports medicine perspective is that the disparity between oral and core body temperatures increases with increasing hyperthermia (>4°F [>2°C] difference when rectal temperature ranges from 103°F to 104°F [range, 39.48°C–40.03°C][14]); therefore, if oral temperature is used as a diagnostic tool for EHS, the spurious results could have a catastrophic outcome.

In 9 resting protocols, researchers wanted to know whether oral temperature devices could be used instead of rectal temperature devices to assess core body temperature. In 8 studies, the accuracy of oral temperature assessment was refuted, and the use of rectal thermometry was encouraged strongly. This information is important not only for the health care provider who needs an accurate estimate of core body temperature but also for the person who is caring for a sick child or adult. The decision to seek additional medical help often depends on temperature assessment, and when a temperature reading is inaccurate, it has the potential to be detrimental, especially if the reading is less than 103°F (39.48°C).

Only a few reliable and valid methods, including rectal, ingestible, esophageal, and pulmonary, are available to measure core body temperature.[4,5,14,15] Rectal temperature assessment devices, in addition to ingestible thermistors, have been shown to accurately measure core body temperature of people at rest or exercising.[1,14,15,23,24] In addition, the NATA and ACSM endorse the use of rectal temperature assessment by health care providers diagnosing a potential EHS. The NATA position statement on exertional heat illnesses recommended, "Measure the rectal temperature if feasible to differentiate between heat exhaustion and heat stroke."[5(p334)] In addition, the NATA position statement advised, "The ATC [athletic trainer] should not rely on the oral, tympanic, or axillary temperature for athletes because these are inaccurate and ineffective measures of body-core temperature during and after exercise."[5(p334)] Similarly, the ACSM position stand is very clear on which devices are inappropriate in the diagnosis of EHS: "Ear (ie, aural), oral, skin, temporal, and axillary temperature measurements should not be used to diagnose or distinguish EHS from exertional heat exhaustion."[4(p561)] Esophageal and pulmonary temperature assessment devices also have

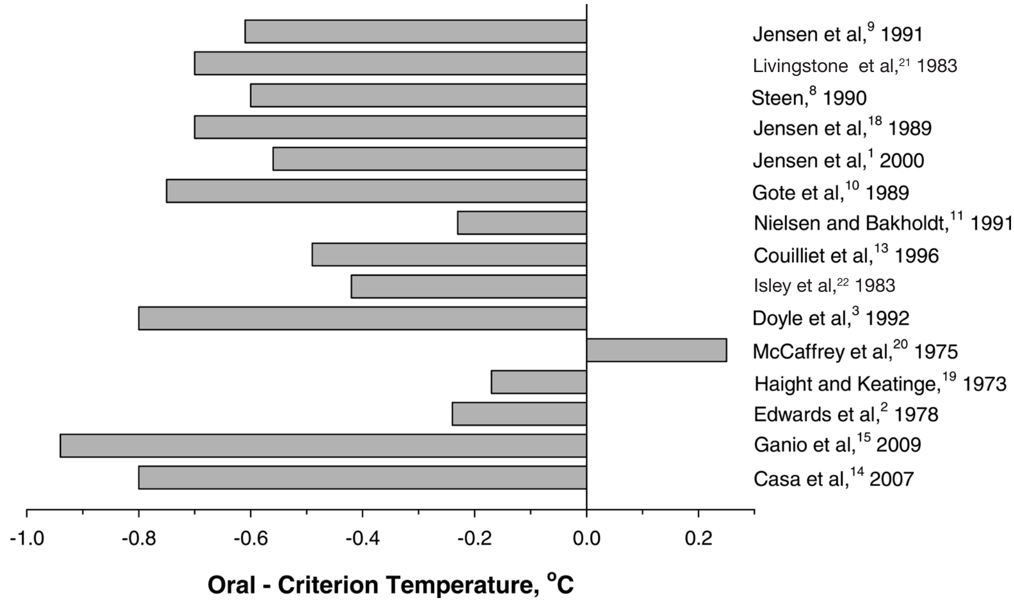

Figure 3. Mean difference between oral and criterion standard temperatures at rest for each study analyzed.

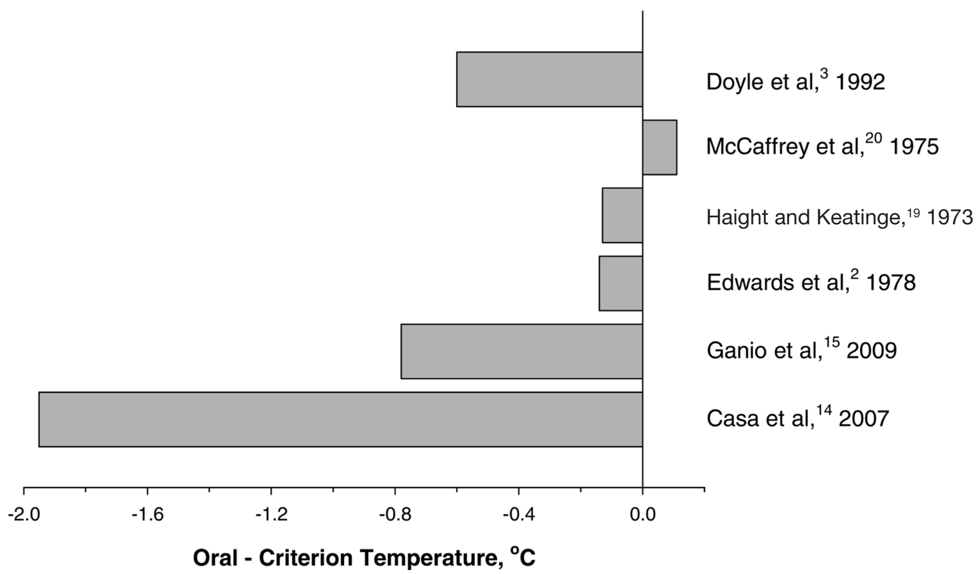

Figure 4. Mean difference between oral and criterion standard temperatures during changes in body temperature for each study analyzed.

been documented to provide accurate measurements of core body temperature for people at rest, specifically for those suspected of having hyperthermia due to an illness,[2–3,23,25] but are not practical devices to use in the sports medicine field setting.

When rectal and oral temperature assessment devices were compared in resting and exercising participants, investigators found that oral temperature was not an accurate measurement of core body temperature.[1–3,8–15] However, many medical professionals still use oral temperature devices to assess core body temperature in their patients.[6,7] A recent investigation[6] of ATs' use of evidence-based practice for EHS revealed that 49.1% of secondary school and collegiate ATs used oral temperature devices to evaluate core body temperature. Although the ATs acknowledged that rectal temperature assessment is more accurate than oral temperature assessment, lack of training with the devices, misgivings about their use and cost, and legal issues created impediments to implementation.[6,26,27]

Many factors, including improper or inconsistent placement of the probe, consumption of fluids before a reading, respiratory temperatures, and ambient air temperature, influence the ability of an oral temperature assessment device to provide an accurate estimate of core body temperature. Edwards et al[2] demonstrated the influence of environmental factors and exercise on oral temperature, showing that regardless of condition, a difference existed between oral and criterion standard temperatures. This information must be disseminated to health care providers to help reduce the use of oral temperature assessment devices for the evaluation of core body temperature. Moreover, because medical care providers rely heavily on past experiences or previous training, educational programs and governing bodies must enforce professional guidelines and standards, which require hands-on training with rectal temperature assessment devices. Increasing the comfort level and dispelling myths associated with the use of rectal temperature assessment devices can help lead to implementation in clinical practice and a reduction in the number of deaths from EHS.

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