INPLASY PROTOCOL

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UPDATE: Establishing a Heat Stress Indicator for work in a warming world

Ioannou, LG[1]; Mantzios, K[2]; Flouris AD[3].

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Corresponding author:
Leonidas Ioannou

ioannouLG@gmail.com

Author Affiliation:
FAME Laboratory, School of Exercise Science, University of Thessaly, Greece

Support: **European Union and ILO.**

Review Stage at time of this submission: **Data analysis.**

Conflicts of interest:
Authors declare no competing interests.

Review question / Objective: **The aim of this systematic review is to investigate the ability of existing thermal stress indicators to quantify occupational heat strain experienced by workers who work in different environmental conditions. Specifically, the purpose of this study is to identify all the thermal stress indicators developed during the last century and thereafter comparing them with physiological data (core temperature, mean skin temperature, and heart rate) collected from hundreds of workers who work in different industrial sectors (agriculture, manufacture, tourism, construction, military, mining, and public servants) across the world.**
Condition being studied: **Thermal stress indicator developed to protect workers who perform work in the heat.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 04 October 2020 and was last updated on 04 October 2020 (registration number INPLASY2020100009).

INTRODUCTION

Review question / Objective: **The aim of this systematic review is to investigate the ability of existing thermal stress indicators to quantify occupational heat strain experienced by workers who work in different environmental conditions. Specifically, the purpose of this study is to identify all the thermal stress indicators developed during the last century and thereafter comparing them with**

physiological data (core temperature, mean skin temperature, and heart rate) collected from hundreds of workers who work in different industrial sectors (agriculture, manufacture, tourism, construction, military, mining, and public servants) across the world.

Condition being studied: Thermal stress indicator developed to protect workers who perform work in the heat.

METHODS

Search strategy: Electronic databases: Pubmed; ProQuest: Agricultural and Environmental Science Collection; Web of Science; Scopus; Embase; Web of Science: Russian Science Citation Index; MEDLINE; and Google Scholar. Algorithm: (((Thermal[Title] OR heat[Title]) AND Indices[Title])) NOT (rat[Title] OR cattle[Title] OR animal[Title] OR mice[Title] OR vegetation[Title] OR genotypes[Title] OR lithium[Title] OR refractive[Title] OR plant[Title] OR water[Title] OR electric[Title] OR milk[Title] OR tree[Title] OR farm[Title] OR petrol[Title] OR oil[Title] OR molecular[Title] OR wheat[Title] OR crop[Title] OR pain[Title] OR liquid[Title] OR organic[Title] OR pollution[Title]).

Participant or population: Workers.

Intervention: Non-applicable.

Comparator: Non-applicable.

Study designs to be included: We identified heat stress indicators via a systematic review across eight databases. A computer software will be developed to calculate the identified thermal stress indicators. Thereafter, this software will be utilized to examine the capacity of all heat stress indicators for quantifying the magnitude of occupational heat strain experienced by workers across the world. For this reason physiological data will be collected.

Eligibility criteria: All thermal stress indicators developed to protect workers who work in thermally challenging environments were eligible to be included in our study.

Information sources: Electronic databases: Pubmed; ProQuest: Agricultural and Environmental Science Collection; Web of Science; Scopus; Embase; Web of Science: Russian Science Citation Index; MEDLINE; and Google Scholar.

Main outcome(s): We found 309 unique heat stress indicators, of which 185 utilizing only meteorological data were considered for further analysis. All 309, heat stress indicators will be tested against physiological data collected from hundreds of workers who work in different industrial sectors across the world.

Additional outcome(s): Environmental factors utilized by each thermal stress indicator.

Quality assessment / Risk of bias analysis: As a meta-data-analysis is not able to be performed (our systematic review aims to identify all the thermal stress indicators [mathematical models] developed to protect workers health), a risk of bias assessment could not be conducted.

Strategy of data synthesis: We will provide a narrative description of the findings of the eligible studies. Tables will be produced to detail the included studies and their outcomes. In addition, we will synthesis these reviews and develop a user-friendly tool (computer software) which will allow researchers around the globe to calculate the identified thermal stress indicators.

Subgroup analysis: Non-applicable.

Sensibility analysis: Non-applicable.

Language: English.

Country(ies) involved: Greece.

Keywords: Heat stress indicators, thermal index, heat index, occupational, work, labor.

Contributions of each author:

Author 1 - Leonidas G. Ioannou - Conceptualization, data curation, formal analysis, investigation, methodology, project administration, software development, writing – original draft.

Author 2 - Konstantinos Mantzios - development, writing – original draft.

Author 3 - Andreas D. Flouris - Conceptualization, data curation, formal analysis, investigation, methodology, project administration, software development, writing – original draft.