



Review

Classification of factors influencing the use of infrared thermography in humans: A review



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HIGHLIGHTS

- The number of the factors that affect the skin temperature (Tsk) in humans is tremendously large.
- This review proposes a comprehensive classification in three primary groups: environmental, individual and technical factors.
- Further research is necessary to delimit the unspecified influence of most of the factors and to improve this classification.

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ABSTRACT

Body temperature is one of the most commonly used indicators of health status in humans. Infrared thermography (IRT) is a safe, non-invasive and low-cost technique that allows for the rapid and non-invasive recording of radiating energy that is released from the body. IRT measures this radiation, directly related to skin temperature (Tsk) and has been widely used since the early 1960s in different areas. Recent technical advances in infrared cameras have made new human applications of IRT (beyond diagnostic techniques) possible. This review focuses on the lack of comprehensive information about the factors influencing the use of IRT in humans, and proposes a comprehensive classification in three primary groups: environmental, individual and technical factors. We aim: to propose a common framework for further investigations; to reinforce the accuracy of human IRT; to summarise and discuss the results from the studies carried out on each factor and to identify areas requiring further research to determine their effects on human IRT.

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1. Introduction

Infrared thermography (IRT) is a safe, non-invasive and low-cost technique that allows for the rapid and non-invasive recording of radiating energy that is released from the body [1–3]. IRT measures this radiation, directly related to skin temperature (Tsk). IRT has been widely used since the early 1960s in different areas. During the first decades after its development, research into the use of IRT in humans was mainly focused on its applications as a diagnostic tool. However, IRT was replaced by newer and more accurate technologies (such as X-rays and magnetic resonance imaging). Recent technical advances in infrared cameras have made new human applications of IRT (beyond diagnostic techniques) possible.

Since infrared cameras generate thermal images by electromagnetic waves, we should take into account that the laws of optics are applicable for image creation [4–6]. Likewise, as the source of infrared radiation is heat energy, temperature and heat exchange,

the laws of thermodynamics must be mentioned and outlined [5,7,8].

Working with IRT requires accounting for many factors that can influence either the evaluation or the interpretation of the thermal images [9]. Attempting to control for such a large number of factors may seem impossible, but simply being acquainted with these factors is an important step in many contexts. Therefore, the primary objective of this article is to propose a classification of the factors that influence the application of IRT in humans.

2. Methods

Medline, Pubmed, ISI Web of Knowledge, Ingenio, Science Direct, EBESCO, Springerlink, IEEE Xplore and Google Scholar were used as search engines to identify studies related with infrared thermography and all that influence factors. Due to the huge list of keywords, there was not a unique “search sentence”, but a combination between the common keyword of “infrared thermography or thermal imaging or thermology or infrared or

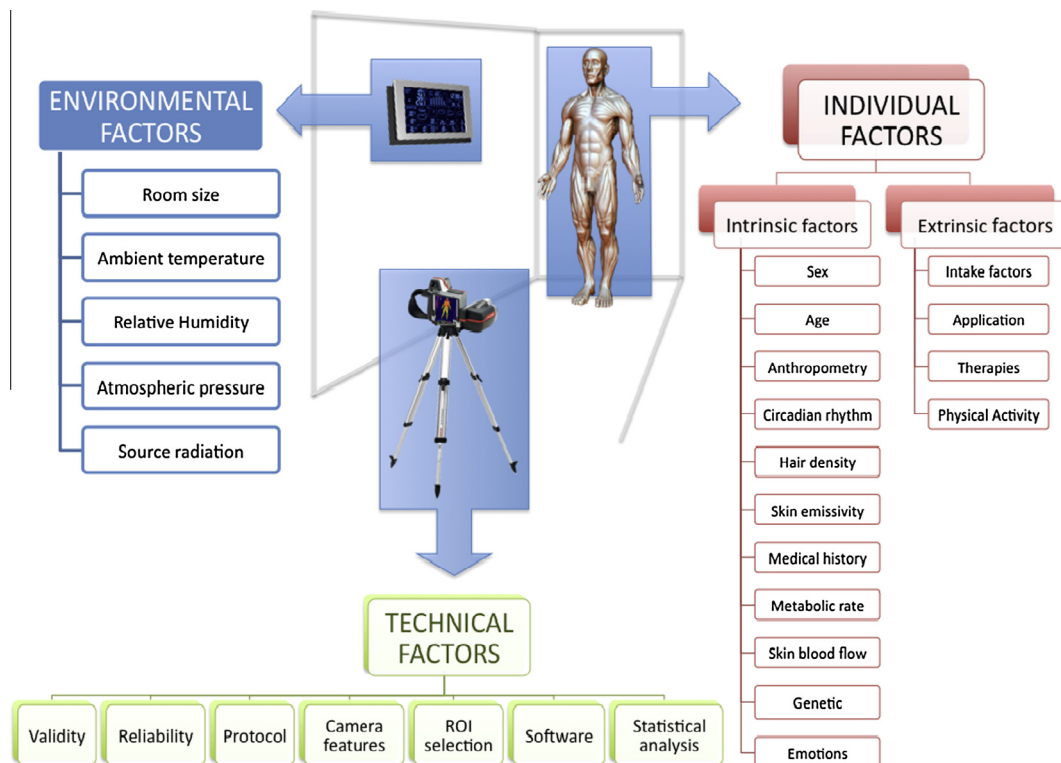


Fig. 1. Representation of the classification of IRT-related factors in humans.

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