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ABSTRACT:

Processing Approaches for Thermal Maps to Monitor the Condition of the Residual Limb in Lower-Limb Prosthesis Users: A Systematic Review

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Currently, problems associated with the use of lower limb prostheses persist, including mechanical stress and the accumulation of heat and moisture in the residual limb due to interaction with the prosthetic socket. A suitable socket allows efficient fitting and appropriate load transfer, which are key factors in the successful use of the prosthesis. Traditionally, socket fitting is performed through an iterative process that relies on user feedback and the prosthetist's expertise. This feedback can be unreliable in new prosthesis users, who may incorrectly assess discomfort, assuming it is part of the process; likewise, in users with sensory neuropathy, which implies a lack of tactile and thermal sensitivity, as in users with diabetes. Thermography is a non-invasive technique that uses images to map the temperature of an object of interest and is widely used to monitor skin temperature; however, it is a technique sensitive to environmental conditions. The use of thermography as a quantitative tool for evaluating the interaction between the residual limb and the socket has been reported in the literature. The aim of this study is to review the papers published in the Scopus, Web of Science, and PubMed databases over the last 11 years that use thermography to monitor the residual limb of lower limb prosthesis users in order to detect mechanical stress or poor heat dissipation, and to analyze the feasibility of this technique for preventing damage to the residual limb tissue. After applying the inclusion and exclusion criteria, eight articles were selected. The experimental conditions for acquiring the thermal maps and the processing algorithms were examined. The discussion emphasizes the findings from the thermal profiles and how this information is useful for preventing tissue damage.