

ABSTRAK

PENGEMBANGAN ALAT *LOW LEVEL LASER THERAPY* BERBASIS SENSOR PENGUKUR LUKA OTOMATIS (*LASTHERA MODIFIED*) DALAM PENYEMBUHAN LUKA ULKUS KAKI DIABETES MELLITUS

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Latar Belakang: Diabetes mellitus sering menimbulkan komplikasi berupa ulkus kaki diabetes yang sulit disembuhkan, sehingga meningkatkan risiko amputasi serta menurunkan kualitas hidup. *Low level laser therapy* berpotensi mempercepat penyembuhan melalui penurunan inflamasi dan stimulasi regenerasi jaringan, tetapi alat yang tersedia umumnya belum dilengkapi dudukan ergonomis, pengatur waktu, suhu, jarak antara alat dan luka serta sensor pengukur luka otomatis. Karena itu, pengembangan *LASTHERA MODIFIED* diperlukan untuk mendukung terapi dan evaluasi penyembuhan ulkus kaki diabetes secara lebih akurat, efisien, dan aman.

Metode: Penelitian ini menerapkan metode *Research and Development* (R&D) dengan tahapan *prototyping*. Uji validitas dilakukan menggunakan *Content Validity Index* (CVI) sedangkan uji reliabilitas menggunakan *Intraclass Correlation Coefficient* (ICC). Kelayakan alat dinilai menggunakan kuesioner USE, dan uji pada kelompok kecil dianalisis menggunakan *Mann whitney test*.

Hasil: Uji validitas dengan nilai *mean I-CVI* 0,95, sedangkan uji reliabilitas ICC dengan hasil 0,932. Kelayakan alat dinilai menggunakan kuesioner USE, dan uji pada kelompok kecil dianalisis menggunakan *mann whitney test*. Uji kelayakan menggunakan USE dengan hasil 94,95% yang menunjukkan bahwa alat memenuhi kriteria *usability*. Pada uji kelompok kecil, hasil analisis menunjukkan *p-value* 0,000 (<0,05), yang menandakan terdapat perbedaan yang bermakna antara nilai *pre-test* dan *post-test* dengan perbaikan hasil penyembuhan luka setelah intervensi.

Kesimpulan: *LASTHERA MODIFIED* menunjukkan hasil uji validitas pakar valid dan reliabel, serta berada pada kategori sangat layak, sehingga dinilai sesuai untuk digunakan memenuhi kebutuhan pengguna. Pada uji kelompok kecil, penggunaan *LASTHERA MODIFIED* juga terbukti mendukung percepatan proses penyembuhan luka.

Kata Kunci: *Low level laser therapy*, penyembuhan luka, Perawatan luka, Ulkus kaki DM

ABSTRACT

DEVELOPMENT OF A LOW-LEVEL LASER THERAPY DEVICE INTEGRATED WITH AN AUTOMATIC WOUND-MEASUREMENT SENSOR (LASTHERA MODIFIED) FOR THE HEALING OF DIABETIC FOOT ULCERS

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Background: Diabetes mellitus often leads to complications such as diabetic foot ulcers that are difficult to heal, increasing the risk of amputation and reducing quality of life. Low level laser therapy may accelerate wound healing by reducing inflammation and stimulating tissue regeneration; however, most available devices lack an ergonomic stand, timer, temperature control, adjustable distance between the device and the wound, and an automatic wound-measurement sensor. Therefore, the development of LASTHERA MODIFIED is needed to support more accurate, efficient, and safe therapy and evaluation of diabetic foot ulcer healing.

Methods: This study employed a Research and Development (R&D) approach with a prototyping stage. Validity testing was conducted using the Content Validity Index (CVI), while reliability was assessed using the Intraclass Correlation Coefficient (ICC). Device feasibility was evaluated using the USE questionnaire, and small-group testing was analyzed using the Mann–Whitney test.

Results: The validity test showed a Mean I-CVI value of 0.95, while the reliability test yielded an ICC value of 0.932. Feasibility assessment using the USE questionnaire resulted in a score of 94.95%, indicating that the device met usability criteria. In the small-group test, the analysis showed a p-value of 0.000 (<0.05), indicating a statistically significant difference between pre-test and post-test scores, with improved wound healing outcomes after the intervention.

Conclusion: LASTHERA MODIFIED demonstrated valid and reliable expert evaluation results and was categorized as highly feasible, indicating its suitability for meeting user needs. In small-group testing, the use of LASTHERA MODIFIED was also shown to support accelerated wound healing.

Keywords: Diabetic foot ulcer, Low level laser therapy, Wound care, Wound healing