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Estimation of the diagnostic accuracy of organ electrodermal diagnostics

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4.0 IMPLEMENTATION OF OPTIMAL PARAMETERS TO OED DEVICE

The statistical characterization of the electrical impedance and resistance of the OPA, as described in the previous section, allowed the selection of optimal parameters for OED, which maximize the difference in impedance or resistance measured at OPA related to diseased and healthy organs.

For AC measurements, low frequency and high amplitude are most suitable. Therefore 250Hz was selected as the measurement frequency, since lower frequencies produced uncomfortable sensations under the measuring electrode. Measuring current amplitude was chosen to be 25uA (peak) since it was observed to be below the perception threshold.

For DC measurements, the highest amplitude of the measurement stimulus that does not cause uncomfortable sensations is the most suitable. After the ‘breakthrough effect’ the skin resistance is very low, therefore 25uA was chosen as optimal.

According to these parameters the OED device ‘Diagnotronics’ (Fig. 4.1) was built by the CE certified company TTS Electronics (Pty) Ltd. under the supervision of an electronic engineer Georg Lochner, in terms of the South African government’s SPII programme. ‘Diagnotronics’ has successfully undergone quality assurance testing by TEST Africa. The device can do diagnostic measurements using DC or AC modalities.



Fig. 4.1 OED examination by means of prototype OED device ‘Diagnotronics’. The locations of skin areas corresponding to examined organs and diagnostic results after the examination is completed are displayed on the screen.

When using the DC mode a dry brass point electrode (diameter 1mm) is placed on a particular skin spot and a brass reference electrode (area about $2cm^2$ covered with a conductive gel) placed on the patient's hand. The point electrode is mounted on a spring to ensure that the pressure applied is constant and repeatable. The point electrode is polarized negatively and the potential increased until the ‘breakthrough effect’ was observed (usually between 7V - 15V). The current is then adjusted to 25uA and the skin resistance measured. The polarity of the point electrode is inverted (set to same voltage at which the skin resistance measurement was done but positively polarized) and a second resistance measurement done. These two measurement values, taken from the same skin point, are used to calculate the final result using the formula:

Rectification Ratio= [1-(First Measurement)/(Second Measurement)]* 100%

This measurement regimen is performed automatically by the ‘Diagnotronics’ device with the final Rectification Ratio reflecting the pathology intensity (normal range: 0-60%).

When using the AC mode, a $2cm^2$ calibration electrode covered with a conductive gel is placed in the vicinity of the OPA to be investigated and the reference electrode (also covered with a conductive gel) is placed on the patient's hand. The device determines the impedance value at 250Hz and uses it as a point of reference, to be compared with the impedance value measured with the point electrode (32). This is to avoid the problem of individual basic skin impedance which is different for each person. The final result is displayed as a percentage value indicating the intensity of pathology in the organ related to the examined OPA (normal range: 0-60%).

The Diagnotronics device displays the locations of skin areas corresponding to the examined organs and final results on a screen as 'HEALTHY' (0-40%), 'WITHIN NORMAL LIMITS' (41-60%), ‘SUBACUTE’ (61-80%) and ‘ACUTE’ (81-99%).