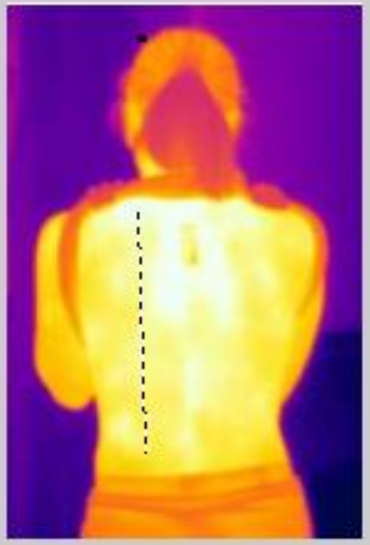
THERMOGRAPHIC IMAGE ANALYSIS IN SCOLIOSIS

A. Papapouliou[1], I. Kalatzis[1], N. Kalyvas[1], A. Skouroliakou[2]

[1]Department of Biomedical Engineering, Technological Educational Institute of Athens
[2]Department of Energy Technology Engineering, Technological Educational Institute of Athens

Purpose - Introduction

- Infrared thermal imaging is a useful tool for assessing skin temperature distribution.
- Scoliosis could result in alterations of the symmetry of skin temperature pattern in the back area of the trunk.



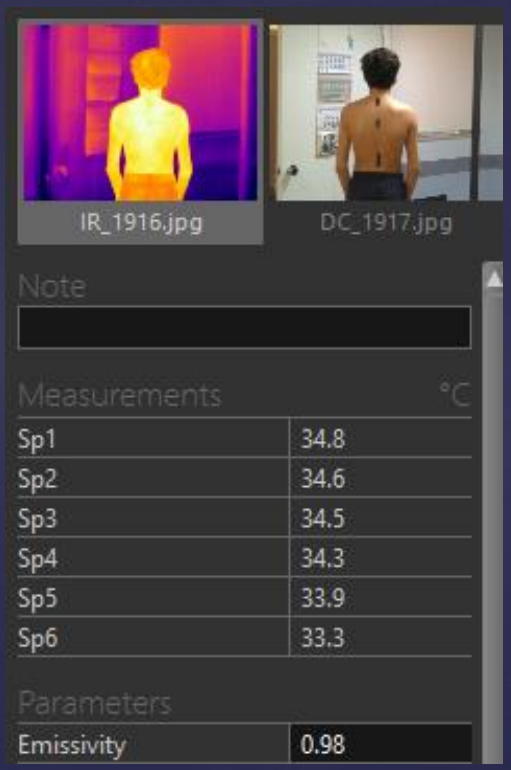
- The purpose of the study is the development of thermographic images analysis techniques to characterize perispinal skin temperature distribution in children suffering from scoliosis

Methods

- Thermograms of the back area of the trunk were obtained from children suffering from scoliosis and normal children.
- The thermographic camera was a FLIR T440, the emissivity was adjusted to 0.98.
- Line profiles symmetrical to the spine were created and processed from the thermograpic images .
- The difference between the symmetrical profiles was evaluated as an index characterizing homogeneity on the thermograms.

Results

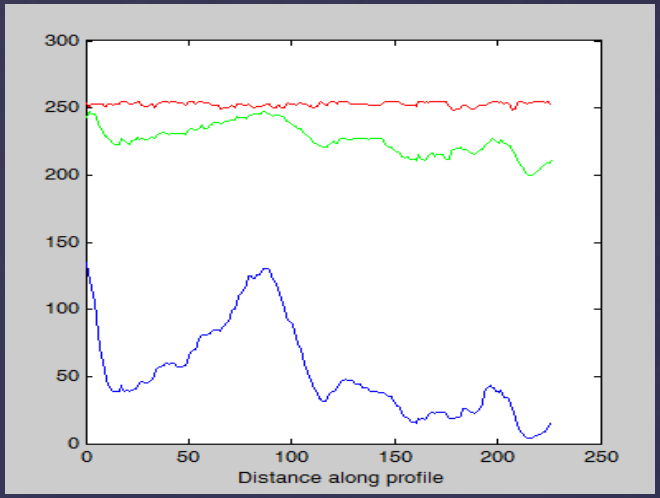
Thermographic image



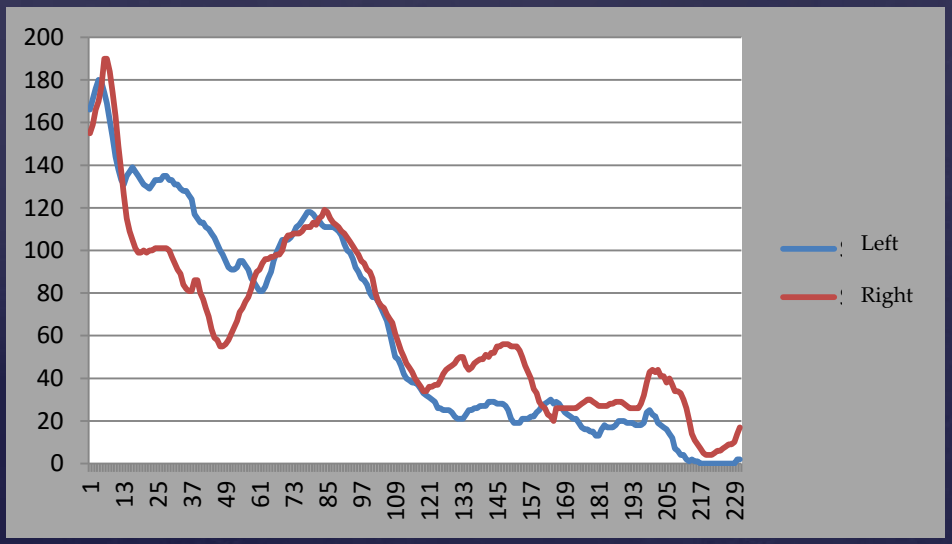
- Temperature measurements in different points can be obtained from the thermogram.
- Temperature differences at symmetric perispinal points are generally in the range of 0-1^{0}C.
- The creation of symmetric perispinal image line profiles could prove more informative.

Results

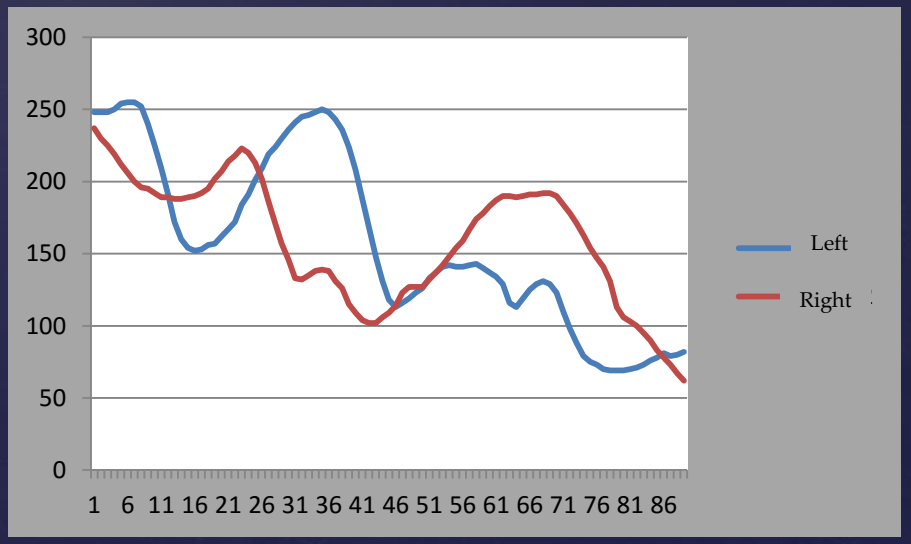
Line Profiles



- The profiles of symmetric perispinal vertical lines at varying distances from the spine were created from the thermographic images.
- Examples from (a) normal and (b) scoliotic case



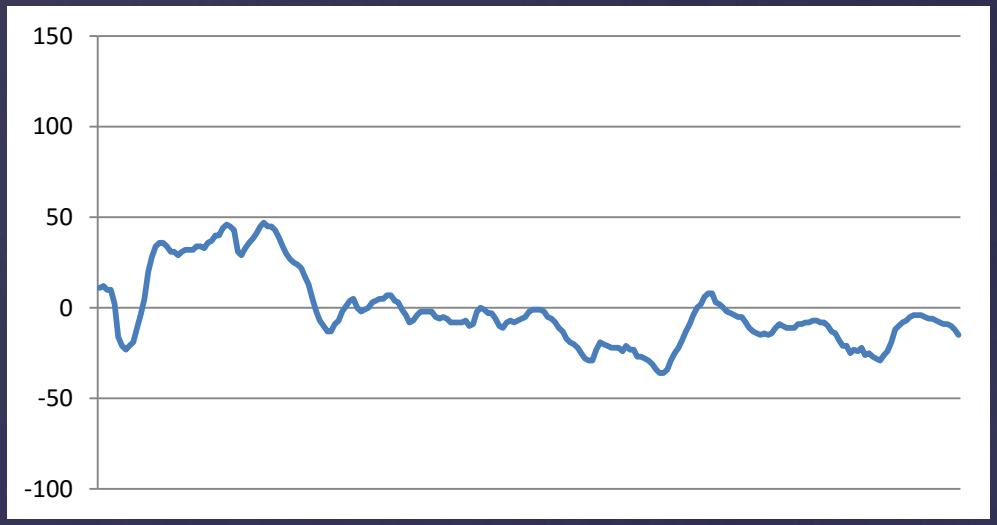
a

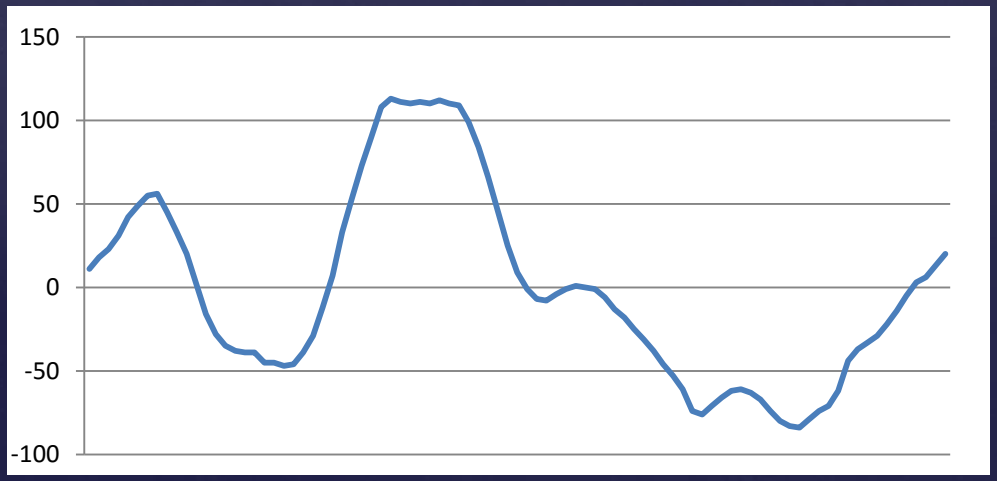


b

Results

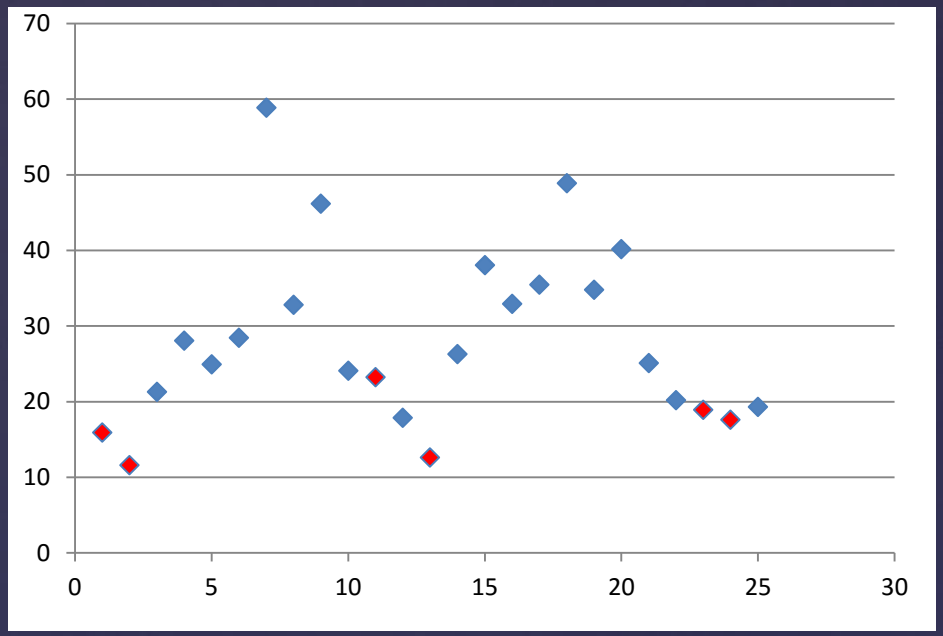
Differential profiles

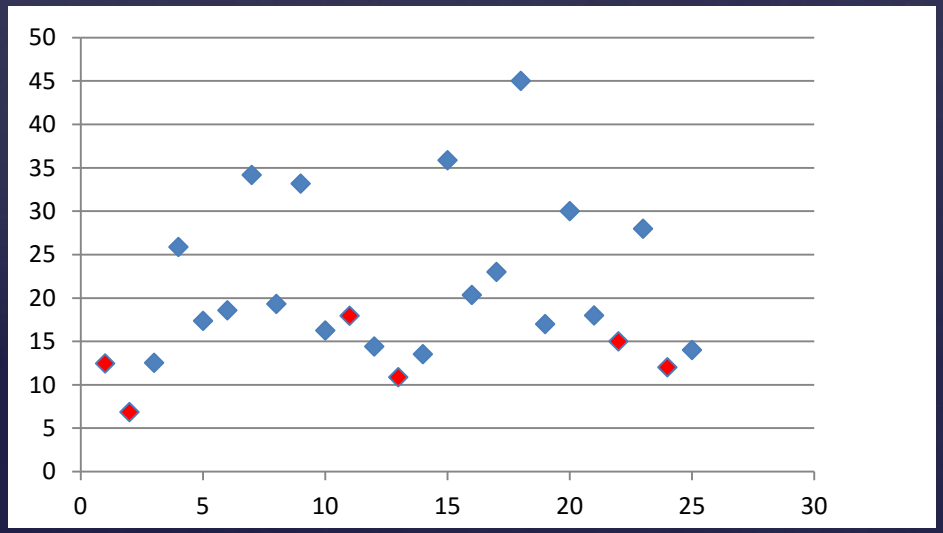




- The difference of the symmetric profiles was calculated.
- Examples from normal (top) and scoliotic (bottom) cases.
- The mean and standard deviation of the absolute difference values were obtained.

Results





- Scatter plots of the mean (top) and standard deviation (bottom) of the absolute values of the profile difference.
- Red and blue data points correspond to normal and scoliotic cases.
- In general pathologic cases are characterised by higher values of mean and standard deviation.

Conclusions

- Temperature distribution homogeneity is altered as a consequence of scoliosis due to changes in metabolism and paraspinal muscles functionality.
- Simple quantitative indices obtained from thermographic images can characterize skin temperature pattern.
- Thermography could have the potential to serve as a complementary tool on the evaluation of scoliosis development and treatment.

Thank you for your attention