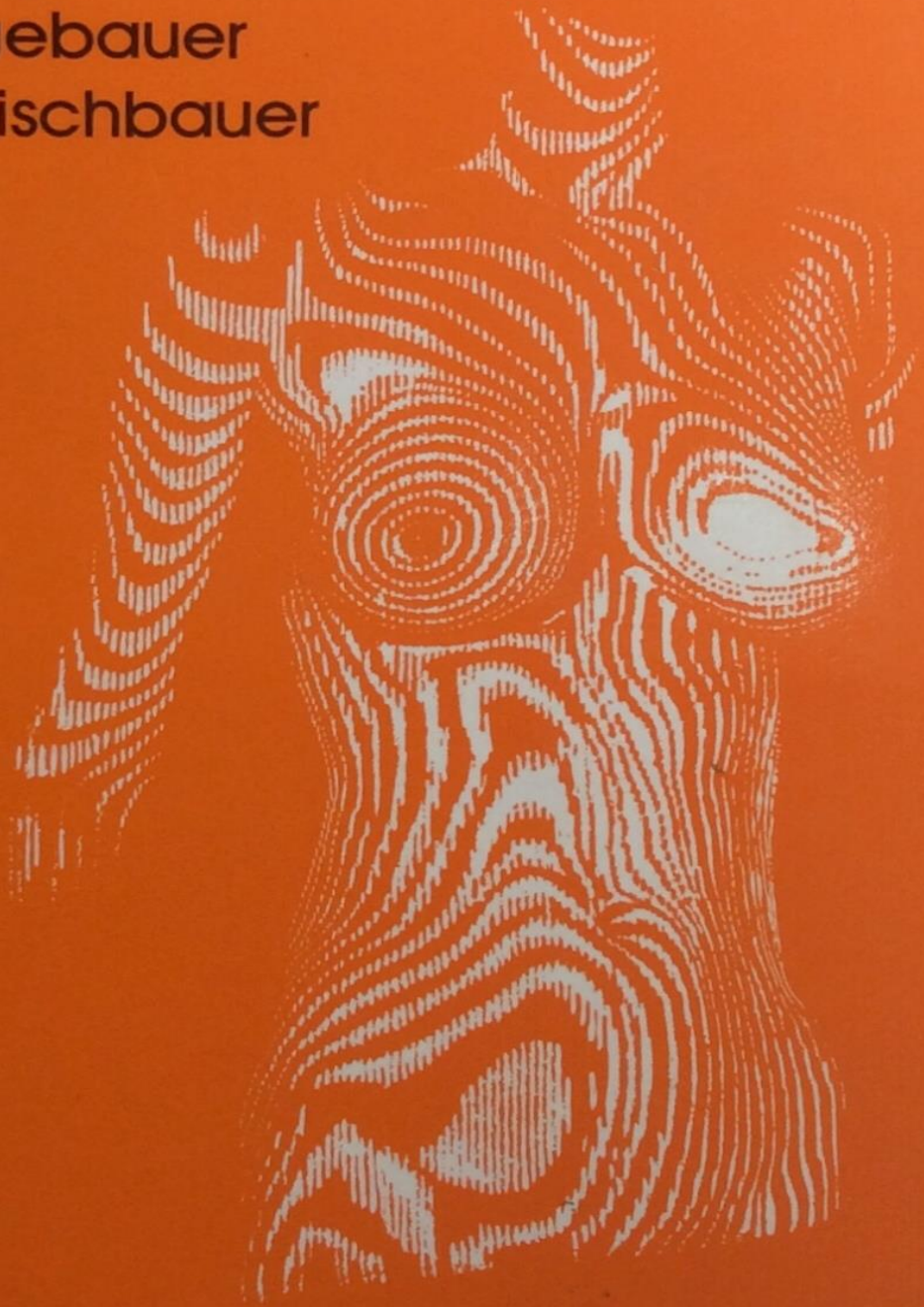
Surface Topography and Body Deformity

Edited by
H. Neugebauer
G. Windischbauer



Gustav Fischer Verlag

Surface Topography and Body Deformity

Proceedings of the 5th International Symposium
September 29 – October 1, 1988 Wien

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4 colour-plates, 191 figures and 26 tables

Gustav Fischer Verlag · Stuttgart · New York · 1990

Neugebauer/Windischbauer: Surface Topography and Body Deformity V Gustav Fischer Stuttgart New York 1990

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A comparison of back moiré topographs of children in the sitting and standing positions

S.A. Kamal[1]*, N. Bukhari[2], M. Akram[1]
Department of Physics[1], University of Karachi,Karachi-75270
Institute of Physics and Technology[2], University of Sind Jamshoro, Sind, Pakistan

Abstract

This is the report on a study being conducted to compare the moiré topographs of children in the sitting and standing positions to determine if there is a significant difference in the two positions.

Introduction

Moiré topography is an inexpensive, simple, noninvasive optical technique which is widely used in different parts of the world to document and diagnose spinal deformities especially scoliosis. Most of the studies done are with the subject in the standing position. However, occasionally moiré topographs are taken in the sitting position (Moskowitz, 1983). This raises the question whether the two positions are equivalent from the kinesiological point of view or there is a significant difference between the two positions.

This paper describes an experiment being conducted to compare the moiré topographs in the two positions.

Mathematical Model

The two positions (sitting and standing) will be considered to be irrelevant for photographing purposes if $\langle\eta\rangle$ for the study comes out to be less than 0. 05 where

$$\eta = (\Lambda_1^2 + \Lambda_2^2 + \Lambda_3^2)/(N_1^2 + N_2^2 + N_3^2)$$

where Λ_i (i= 1,2,3) is the fringe deviation in the standing and sitting position at the midpoint of each of the sides of the triangle formed by joining left scapula, right scapula and a point on the spinous process at the same height as naval. N_i is the number of fringes passing through a given side of the triangle.

Experimental

A shadow type moiré apparatus is being used to take moiré topographs of children 8 to 10 years old. The apparatus consists of a wooden frame of dimensions 40 cm x 80 cm. Nylon thread of 0.7 mm is wound along the longer side with spacing equal to its diameter so that it forms a grating as recommended by Takasaki (1979). A light source of 500 watt is used for the photographing purposes. The light source and camera are placed 150cm from the screen and both are located in a plane parallel to the moiré frame. Light source and camera are situated on a line perpendicular to the stretched threads. The separation of the camera and the light source is 110 cm. For these distances the height difference between successive fringes is 0.2 cm.

One hundred boys between the ages of 8 and 10 years from a local school in Hyderabad (Sind) are requested to participate in the study. Each child is given a forward bending test. The child is marked on the back and goes behind the screen to be photographed in the sitting and standing position. The child is photographed with his shoes and stockings off as recommended by Free (1974).

Measurements are taken on the moiré topographs to calculate η for each photograph. At the end of the study $\langle\eta\rangle$ will be calculated.

Conclusions

This study when completed will provide us an-

*Syed Arif Kamal; MA, Johns Hopkins, Baltimore, MD, United States; MS, Indiana, Bloomington, IN, United States • *e-mail*: profdrakamal@gmail.com • *homepage* • *vita*

swer to the question: Are the two positions sitting and standing equivalent for taking moiré topographs? If the answer comes out to be in the negative, we should be careful which position we are using for scoliosis study. On the other hand, if the answer comes out to be in the affirmative it might be better to obtain moiré topograph in the sitting position because leg length inequality will be avoided in this position.

Acknowledgements

Thanks are due to Shamsuddin Usmani, Principal, Latif Niazi Memorial School, Latifabad, Hyderabad for providing facilities in the school premises to conduct the study.

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Spinal deformities, especially scoliosis, are a severe problem of the young people. The challenge is to prevent surgical intervention by non-invasive screening programs for early diagnosis, to follow-up the effects of treatment and to predict the course of scoliosis. Optical, acoustical and mechanical techniques have been developed to meet this challenge and to minimize the risk of frequent X-raying. Since 1980 an international group of clinicians, engineers and scientists has met bi-anually to share techniques, results and data on body surface shape and spinal deformities. Digital image processing is providing better means for the three-dimensional description and visualization of the human body. Therefore contributions on surgical planning, implant shaping and reconstructive surgery are included to represent the current state of 3D-medical imaging and visualization in this book.

ISBN 3-437-11242-2
US-ISBN 1-56081-303-2