EDITORIAL

A new year with its hopes and expectations has come around again. Will we as physiotherapists be able to make a contribution to the global goal of health for all by year 2000, and are we doing enough to prepare ourselves and future physiotherapists for the different role our profession will probably play in the new South Africa? Let us be proactive and decide what will be necessary to meet future challenges before someone else decides on our role.

At a time when the greenhouse effect and pollution of our planet is of concern to everyone, physiotherapists must realise that they too may need to make a contribution to improve the world's health. In the article by Esterhuyse and Irwin-Carruthers the effect of atmospheric dioxide and nitrate gases on the respiratory system is investigated. The authors found a decrease in the lung function of children tested due to the pollution, and have suggested that the acceptable limits for atmospheric SO$_2$ and NO$_2$ need to be redefined. As physiotherapists we do need to become involved and lobby for a cleaner environment to which our patients must return when discharged from our care.

In order to meet the challenges of first contact physiotherapists we need to give even greater attention to the assessment of our patients. It is important to find an objective method of assessing especially in the field of neurology where many of our evaluation techniques are subjective and not always reliable. In the study by Morton et al the authors and selected physiotherapists experienced in the field viewed video recordings made of cerebral palsy children who had undergone selective posterior rhizotomy. They found that it was not possible to objectively assess these children using video recordings which were not standardised and have recommended a format to be used when making such recordings in the future.

In the article by van der Merwe et al the safety and efficacy of ultrasound therapy is discussed. In the experiment undertaken it was found that energy distribution of ultrasound is not constant and the high spatial intensities within the beam may cause damage to the patients' tissues. Because the effective radiating area (ERA) which was measured by the authors was consistently higher than the ERA rated by the manufacturers, it is important to be aware of the dangers that could be associated with ultrasound therapy, a modality which is commonly used by physiotherapists.

It behoves all of us to ensure that not only do we treat our patients effectively but we must also use reliable and valid methods of assessment and after treatments. The modalities that we use must be safe and correctly applied and when our patients are ready for discharge we must attempt to make sure that they will be able to cope in their communities to which they return.

AN EVALUATION OF THE LUNG FUNCTION OF EIGHT TO TWELVE YEAR OLD CHILDREN LIVING IN TABLE VIEW, CAPE TOWN

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INTRODUCTION

During the last decade there has been an increasing awareness of environmental pollution and, in particular, of the effects of pollution on man's health and his continued existence. In the Cape Peninsula this problem is as pressing as elsewhere. If one drives in the direction of Table View and Bloubergstrand there is always a visible cloud of gaseous smoke which varies in degree and shifts in position according to the wind direction. These gases originate in the petrochemical industries in this area. Many children in the Table View, Edgemead and Bothasig area undergo daily exposure to the sulphur dioxide (SO$_2$), ozone (O$_3$) and nitrate (NO$_2$) gases produced.

Physiotherapists and medical doctors practising in these areas confirm that local inhabitants too are concerned about the potential threat to their health caused by these pollutants. At the request of local authorities and the Department of Health, the CSIR conducted an epidemiological study during 1983, in which they investigated the effects of air-pollution on the mortality and morbidity of local inhabitants, with specific reference to respiratory problems. No statistically significant evidence of increased mortality was found in the experimental area. Morbidity was assessed by means of notification of respiratory diseases, completion of questionnaires and self-evaluation of their symptoms by previously identified bronchitis sufferers. An increased incidence of respiratory problems was reported by people living in the experimental area.

In 1988 the Department of Physiotherapy, University of Stellenbosch, conducted a follow-up study aimed at obtaining more objec-
tive evidence of the effects of air-pollution on lung functions. This study was conducted on children, as they are considered to be more susceptible to the damaging effects of pollutants gases whilst their lungs are still developing prior to the onset of puberty. There is a growing belief that respiratory disease in children predisposes to the development of respiratory morbidity and early mortality in the adult. Repeated lung infections in the child can lead to chronic airway disease.

Overseas studies on the effects of environmental factors on the respiratory function of children have demonstrated an increased incidence of respiratory symptoms and decreased, pulmonary function in environments where there was a high percentage of sulphur dioxide in the air. Improvement in the quality of the atmosphere resulted in reduction of symptoms and increased lung function.

Pure sulphur dioxide is regarded as a mild respiratory irritant which causes upper airway irritation. By stimulating the sensory nerve endings in the mucous membrane, inhalation of SO₂ results in a burning sensation in the nose which inhibits respiration, accompanied by coughing due to laryngeal irritation. Stimulation of the trigeminal nerve endings also causes burning of the eyes with increased tear formation. SO₂ can also act as a bronchoconstrictor, causing resistance to airflow accompanied by pain due to irritation of the bronchial mucosa.

When SO₂ occurs with humidity, sulphuric acid is formed. H₂SO₄, NO₂ and O₃ are all pulmonary irritants and penetrate to the lower airways, resulting in increased respiratory rate and decreased tidal flow, presenting as dyspnoea.

**METHOD**

The sample was drawn from two well-delineated subdivisions of Table View, Sunridge and Bloubergstrand. These two areas are occupied by families of similar socio-economic status and have the same prevailing winds, namely south-east (140-210°) and north-west (280-350°). Sunridge lies closer to the petrochemical complex and more directly in line with the prevailing south-easter which blows from the direction of the complex. Bloubergstrand lies outside the area of visible pollution and the Bloubergstrand sample was regarded as the control group, although a certain level of air-pollution cannot be excluded.

Criteria for inclusion in the sample were that the child had to be aged between eight and twelve years, have lived in the area continuously for at least five years and not have any cardiac problems. Potential children for inclusion in the sample were identified by house to house visits and interviews with the parents. When a child was identified as satisfying the criteria, the parents were requested to complete a questionnaire (standardised questionnaire ATS DLD 78C) which was collected the same evening. Due to limited time, only 20 children in each area were identified. From the 40 questionnaires completed, thirty (15 from each area) were drawn randomly and these children underwent lung function tests.

Testing was performed at a central venue, by appointment. On arrival each child was weighed and measured (barefoot). Careful explanation of the lung function tests was given to the child, each child being tested at least twice and up to four times if the child experienced difficulty. The child’s best results were recorded. The measuring instrument used was the ELF (Electronic Lung Functions) apparatus, which was programmed to recalculate automatically before each test. The following parameters were measured:

- FVC (forced vital capacity)
- FEV₁ (forced expiratory volume in 1 second)
- FEV₁% (forced expiratory volume in 1 second)
- FEF25 (forced expiratory flow at 25% of vital capacity)
- FEF50 (forced expiratory flow at 50% of vital capacity)
- FEF75 (forced expiratory flow at 75% of vital capacity)
- PEFR (peak expiratory flow speed)

All measurements were taken and computed by the ELF, which gave an immediate print-out of results and diagnosis. Mean and standard deviation were calculated for each parameter. An independent observer (specialist in internal medicine) identified tests which had been incorrectly performed and these were excluded from the results.

Information derived from the questionnaire was subjected to computer analysis using the REFLEX programme and results were tabulated.

**RESULTS**

In the results and discussion the Bloubergstrand sample (further from the petrochemical complex) is designated group A and the Sunridge sample (nearer to the petrochemical complex) is designated group B.

The ratio of boys to girls was 9:11 in group A and 6:14 in group B. The mean age of the group A children was 10.2 years (range 8-12) and that of the group B children was 10.8 years (range 9-12).

**Questionnaires**

All 40 questionnaires were returned completed. There was a higher reported incidence of respiratory disease in group B, but because the sample is so small no statistical significance can be attached to the differences in incidence of the various specific diseases (Table 1).

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>GROUP A</th>
<th>GROUP B</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHRONIC BRONCHITIS</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>ACUTE BRONCHITIS</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ASTHMA</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>OTHER DISEASES IN 1ST 2YR</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>SINUSITIS</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>BRONCHIOTUS</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>BRONCHITIS</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>ASTHMATIC BRONCHITIS</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>MIDDLE EAR INFECTION</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>TOTAL INCIDENCE</td>
<td>18</td>
<td>36</td>
</tr>
</tbody>
</table>

No difference was found between the groups in the occurrence of the following signs: cough accompanying a cold, cough in the absence of a cold, chest secretions in the absence of a cold. Group B showed a higher incidence of chest secretions accompanying a cold. A higher incidence of allergies and cough was reported in group A but in both groups the numbers were very small. There were slightly more smokers in group B homes (13:18) but no relationship was found between the incidence of asthma and the number of smokers in the home.

**Lung function tests**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>GROUP A</th>
<th>GROUP B</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV₁</td>
<td>93.5833</td>
<td>95.3646</td>
</tr>
<tr>
<td>FVC</td>
<td>104.917</td>
<td>107.077</td>
</tr>
<tr>
<td>FEV₁%</td>
<td>89.6657</td>
<td>89.6653</td>
</tr>
<tr>
<td>FEF25</td>
<td>101.817</td>
<td>107.308</td>
</tr>
<tr>
<td>FEF50</td>
<td>82.3333</td>
<td>77.8462</td>
</tr>
<tr>
<td>FEF75</td>
<td>64.75</td>
<td>92.6663</td>
</tr>
<tr>
<td>PEFR</td>
<td>91.75</td>
<td>101.231</td>
</tr>
</tbody>
</table>
In group A the results of two children had to be excluded because they were unable to carry out the tests correctly. One group B child refused to take the tests, whilst a second child's results had to be excluded due to a mechanical fault. Thirteen sets of lung function tests in each group were thus available for analysis. For each child, the results were correlated with his or her age, weight and height and calculated as a percentage of the predicted values according to Schoenbarg. 8

Table 2 compares the average values for the two groups. Graphical representation of the average percentage values reveals no significant differences in lung function between the two groups (Figure 1). In both groups, however, the FEV₁, FEV₁% and FEF₂₅ are lower than the normal average of 100% predicted by Schoenbarg. Only the FVC in both groups and the PEFR in group B reached normal values.

![Figure 1: Lung function values of 8 to 12 year old children](image)

**DISCUSSION AND CONCLUSIONS**

The higher reported incidence of respiratory disease in group B children, who lived closer to the petrochemical complex, cannot be regarded as statistically significant due to the small sample size. The higher incidence of smokers in group B parents may also have played a role in the higher incidence of disease in this group. Although no correlation was found between the number of smokers in the house and the number of children who suffered from asthma, a previous study has shown that children's lung functions are adversely affected when their parents, and in particular their mothers, smoke. 5  However, a study carried out in Ohio 10 also showed a higher reported incidence of acute and chronic respiratory disease in children attending school in an area of raised SO₂ and NO₂ levels.

No significant difference could be found between the lung functions of the two groups of children, but both groups demonstrated lower values than the predicted norms. 5 Since the possibility of a degree of air pollution in the area of the control group could not be excluded, a further study of a larger sample of children from suburbs bordering on the petrochemical complex is recommended, with a control group from further afield. Although the 1986 CSIR study of the area showed pollution at that time to be within acceptable limits, Mostardi 10 has suggested that the acceptable limits for atmospheric SO₂ and NO₂ be redefined.

**Acknowledgements**

Thanks are recorded to Professor MA de Kock, former Head of the Department of Internal Medicine, University of Stellenbosch, for the provision of the ELF and for training in its use, and also to Dr S Walsh of the same Department for help in analysing the results.

**REFERENCES**


**CHARACTERIZATION OF THE ACOUSTIC OUTPUT OF THERAPEUTIC ULTRASOUND EQUIPMENT**

**OPSOMMING**

Die effektiviteit en veiligheid van ultraklankterapie kan bewaargetrek word indien die levering vanaf terapie-omsetters betekenisvol afwyk vanaf die aangeduide waardes. Alhoewel die totale drywinglevering vanaf 'n omsetter maklik gemeet kan word met behulp van 'n drukba­lans, is dit ook belangrik om te weet hoe die energie ruimtelik versprei is. Bundelprofiel van die energieverspreiding kan verkry word deur gebruik te maak van 'n houdoofoon-afstandsmetre. Vanaf die bundelprofiel kan verskeie parameters soos die effektiewe stralingsarea (ESA) en die nie-uniformiteitsverhouding van die bundel (BNR) verkry word. Aangesien die ruimtelik-geëindigde intensiteit, wat gewoonlik as 'n behandeling parameter gekies word, die verhouding tussen die uitgestraalde drywing en die effektiewe stralingsarea is, is dit van belang om parameters soos die effektiewe stralingsarea te bepaal. In hierdie studie is van 'n houdoofoon-afstandsmetre gebruik gemaak om ESA en BNR metings van kommersiële beskikbare terapie toestelle te verkry.

**DEFINITIONS**

Effective radiating area (ERA) ¹ means the area of the effective radiating surface that consists of all points at which the ultrasonic