Documenta Ophthalmologica Proceedings Series 28

Third International Conference on Myopia

Edited by
H. C. Fledelius, P. H. Alsbirk
and E. Goldschmidt

August 24-27, 1980

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重庆医科大学附属第一医院图书馆
馆藏专用章

Dr W. Junk Publishers The Hague—Boston—London 1981

Distributors:

for the United States and Canada

Kluwer Boston, Inc.
190 Old Derby Street
Hingham, MA 02043
USA

for all other countries

Kluwer Academic Publishers Group
Distribution Center
P.O. Box 322
3300 AH Dordrecht
The Netherlands

Library of Congress Cataloging in Publication Data CIP

International Conference on Myopia (3rd : 1980 : Copenhagen, Denmark)
Third International Conference on Myopia, Copenhagen, August 24-27, 1980.

(Documenta ophthalmologica. Proceedings series ; v. 28)
1. Myopia--Congresses. I. Fledelius, H. C. II. Alsbirk, P. H. III. Goldschmidt, Ernst Walter Matthias, 1933- . IV. Series. [DNLM: 1. Myopia --Congresses. W3 DO637 v. 28 1980 / WW 320 I61 1980t]
RE938.I57 1980 617.7'55 81-5778
AACR2

ISBN 90 6193 725 6 (this volume)
ISBN 90 6193 882 1 (series)

Cover design: Max Velthuijs

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Dr W. Junk Publishers, P.O. Box 13713, 2501 ES The Hague, The Netherlands.

PRINTED IN THE NETHERLANDS

Third International Conference on Myopia

Documenta Ophthalmologica
Proceedings Series volume 28

87.28 B 1

Editor H.E. Henkes

Dr W. Junk Publishers The Hague—Boston—London 1981

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PREFACE

Considering the high incidence of myopia – and its inherent morbidity – it may wonder that the item is dealt with only sporadically in recent literature, and almost never at international conferences.

However, there was a First International Conference on Myopia in New York 1964, and the Second was held in Yokohama 1978, affiliated to the XXIII World Congress of Ophthalmology. Here it was attempted to set outlines for future myopia research, and, as a practical implicaton, the arrangement of the Third International Conference on Myopia was entrusted to Danish ophthalmologists.

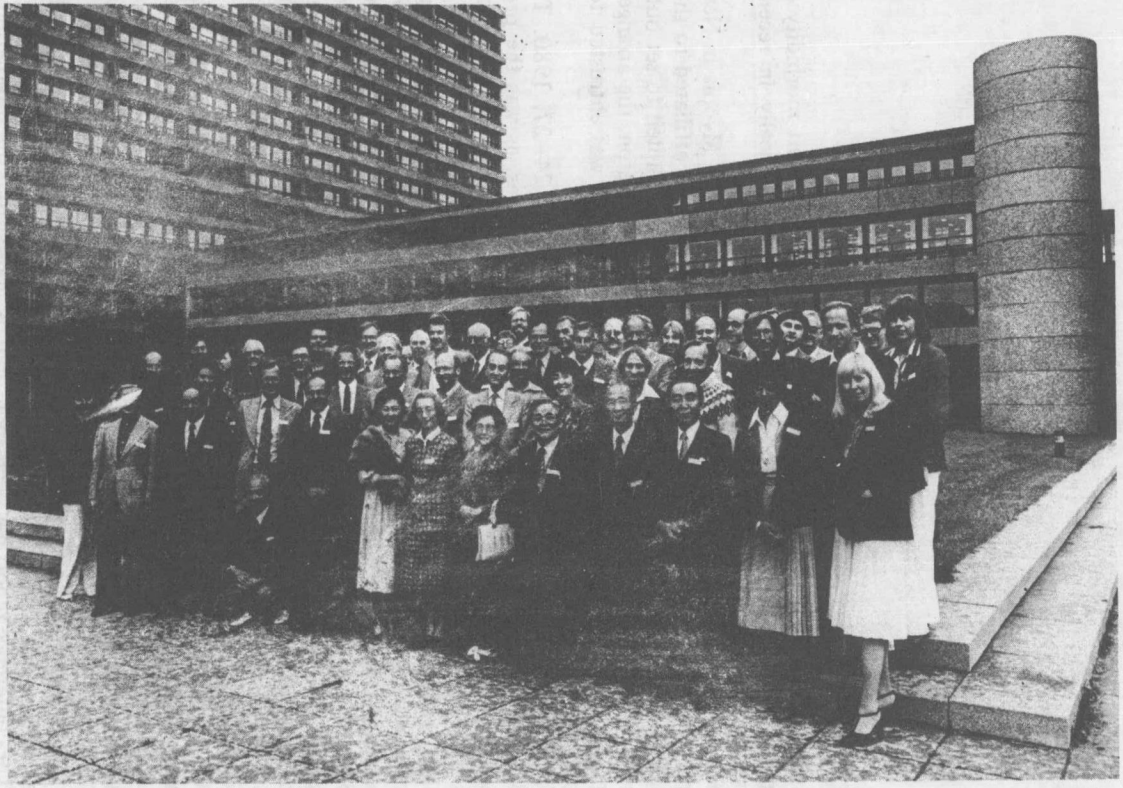
This conference took place in Copenhagen, August 24–27, 1980. To make the scope the widest possible, the conference was, as was the predecessing in Japan, open not only to ophthalmologists, but 'to all being active in the various aspects of myopia research'.

The conference report gives a picture of the Copenhagen meeting. Furthermore, a platform or current status of myopia research has hereby been established. The editors have made it their main task to arrange the papers, and to bring them in a form suited for print, while criticism by editorial referees has been considered inappropriate. The papers give an impression of the ambiguity still prevailing in the field, and although 'trends' are obvious, a final consensus of Conference was not arrived at. To document this state of affairs, however, is considered a useful task.

We further intended to publish the most fruitful discussions, given in relation to the papers presented, but we have decided to omit this due to heterogeneity of the available material. These contributions are, however, collected in an informal supplementum, which will be sent to the conference participants and – on written request (Myopia Conference Secretariat, E 2061, Rigshospitalet, DK-2100 Copenhagen Ø) – to those specially interested.

The conference report has been sponsored by grants from the International Society for Myopia Research and the Tuborg Foundation. The editors are grateful for this support.

Copenhagen, December 1980 THE EDITORS



INTRODUCTION AND WELCOME

Myopia is known in all races, but the frequency varies considerably. Variation also appears within limited population groups, and a great deal of research on the subject has therefore been concerned with the fundamental questions: Why do some people become myopic, but others not? Is myopia caused by external factors or is it hereditary? Is myopia a product of civilization – an environmental disease the reasons for which we do not know – or is it genetically determined and affected only to a limited degree by external conditions?

These problems have been given a leading role in ophthalmological research for more than a century, and there is hardly another field in ophthalmology that has given rise to more violent and passionate discussion. Occasionally the debate has been characterized by strong polemics, with mutual accusations of scientific irresponsibility. Honest attempts to achieve an approximation between adherents to the different schools of thought have been rare, due in part, no doubt, to tradition, orthodoxy and semantic problems.

Just how confused the entire complex of problems is may be revealed by a glance through (even) modern ophthalmic textbooks, where recent discoveries (e.g. within laboratory myopia, genetics and epidemiology) and re-discoveries (regarding myopia and near work) are hardly noticed. It therefore seems necessary to try to evaluate the classical theories against the results from this 'new wave' in myopia research.

There is an increasing demand of qualified and open-minded research leading to a deeper understanding of myopia pathogenesis. We devote the conference to this purpose. A hearty welcome to Copenhagen!

ERNST GOLDSCHMIDT M.D.,
Professor in Ophthalmology,
Chairman of The Conference,
Odense, Denmark

Thank you very much for holding the 3rd International Conference on Myopia. We are so happy to find such a large attendance here, and we deeply appreciate the painstaking and strenuous efforts made by the organizing committee.

Denmark has a very long history of studies on myopia. It was as early as in 1883 that Dr. Tscherning found school myopia to be weak myopia, thus laying, as pioneer, the foundation of our studies of myopia. Dr. Bjerrum, who is famous all over the world for his discovery of scotoma due to glaucoma, reported on the incidence of myopia in 1886. In the 1900s, Dr. Blegvad discovered how myopia tends to develop. These findings are all very important achievements, and represent a brilliant and outstanding tradition of studies, borne by the scholars in the past as well as by the doctors present here today.

It is indeed significant that this academic conference is held in Denmark, a country so closely associated with studies of myopia. We expect that this conference will surely mark another remarkable step in the progress of our studies of myopia.

Thank you for your attention.

TIKASI SATO, M.D.,
President of the International Society for Myopia Research (ISMR), Yokohama, Japan

CONTENTS

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PROPORTION OF MYOPIA IN VISUAL SCREENING OF SCHOOL CHILDREN

L. LAATIKAINEN AND H. ERKKILÄ
(Helsinki, Finland)

ABSTRACT

The prevalence of myopia in late childhood seems to have increased in Finland during the last decades. Eighty per cent of school children with decreased visual acuity and more than half of those annually referred to an ophthalmologist have myopia. Myopia is therefore the main target of the visual screening at school age, and it comprises a great proportion of the work done at the school eye clinics.

INTRODUCTION

The main purpose of visual screening in early childhood is the detection of amblyopia. At school age myopia gradually becomes the commonest cause of decreased visual acuity and the main target of the screening. In Finland visual screening of school children is performed by the school nurse on every child at the age of 7–8, 9–10, 11–12, and 14–15 years. It includes testing of the visual acuity for distance as well as general inspection in order to detect strabismus. Children with decreased visual acuity of less than 0.8 in one or both eyes, obvious strabismus or subjective symptoms related to reading are referred to an ophthalmologist for further eye examination.

In order to estimate the need for ophthalmological health service at school age and to find out the prevalence of refractive errors, strabismus and other ocular abnormalities in school children we performed an ophthalmological survey on 411 children by examining 23 whole classes of pupils representing these age groups (Laatikainen & Erkkilä 1980a). In this paper the proportion and clinical significance of myopia in the survey are presented. For comparison, some statistics from the routine school eye clinic are given.

SUBJECTS AND METHODS

All children were examined by the authors. Visual acuity for distance was tested using the Snellen chart. Cover test and Titmus stereo test were performed, and refraction was determined both before and 40–50 min after

Doc. Ophthal. Proc. Series, Vol. 28,
ed. by H.C. Fledelius, P.H. Alsbirk and E. Goldschmidt
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the instillation of 1% cyclopentolate twice in each eye. Here refractive errors are expressed in spherical equivalents of the cycloplegic values.

RESULTS

In the four age groups studied, each of them consisting of about 100 children, the prevalence of myopia increased successively. In the youngest age group myopia occurred in less than 2% of the eyes whereas in the oldest group myopia of 0.5 D or more was found in 22% of the eyes (Table 1). In 13 cases myopia was monocular. Therefore the percentual figures of myopic children were slightly higher than those of myopic eyes (Table 1). Twenty three of the 47 myopic pupils were girls and 24 were boys. The age distribution of the myopic girls and boys did not differ significantly. Eighteen of the 411 children (4.4%) had had a low birth weight of 2500 g or less. One of them had myopia.

Table 1. Prevalence of myopia in 411 non-selected school children.

Age	Myopic eyes (%)	Myopic children (%)
7–8 (n = 81)	1.9	2.5
9–10 (n = 109)	6.4	7.3
11–12 (n = 111)	7.2	9.0
14–15 (n = 110)	21.8	24.5
Total	9.9	11.4

Table 2. Degree of myopia in 411 non-selected school children.

Age	Number of eyes			
	−0.5 to −1.25 D.	−1.5 to −2.25 D.	−2.5 to −3.25 D.	−3.5 D.
7–8	3	–	–	–
9–10	8	–	6	–
11–12	8	7	1	–
14–15	28	12	3	5
Total	47	19	10	5

In the youngest age group the degree of myopia was less than 1.5 D in all cases, in the other groups about half of the myopic eyes were less than 1.5 D. At the age of 14 years myopia of 3.5 D or more was found in five of the 48 myopic eyes (Table 2). One of the 47 myopic children had astigmatism of 1 D or more. In this case both eyes were astigmatic. The frequency of astigmatism in the myopic group (2.5%) was slightly lower than in the total series (3.6%).

Thirteen of the 47 myopic children (28%) had monocular myopia. The age distribution of the monocular myopes did not differ from that of all myopic pupils. Most monocular cases were mild. Thus anisometropia of

more than 1 D. was found in five of these 13 children – in the group of binocular myopia, anisometropia was found in one of the 34 children. All the monocular myopes had binocular vision. Subnormal recordings at the Titmus test, at the level of 200 seconds of arc of disparity, were found only in those who in addition to monocular myopia had anisometropia of about 2 D or more. One child with monocular myopia had intermittent esotropia, and one had microstrabismus and mild functional amblyopia with the visual acuity of 0.6. Three of the 34 binocular myopes had manifest strabismus, but none of them had amblyopia.

In this survey 43 of the 55 children (78%) with visual acuity of less than 0.8 in one or both eyes, and 64% of all fulfilling the criteria for further eye examination, were myopic. The corresponding percentages in the first year statistics at the routine school eye clinic were 76 and 57%.

DISCUSSION

According to the results of the survey it could be expected that 10% of all school children would annually fail at the screening of the visual acuity (Laatikainen and Erkkilä 1980b). Almost 80% of them would have myopia. The proportion of myopic children at the routine school eye clinic corresponded with these results.

At the survey the prevalence of myopia at the age of seven years corresponded with that reported from Finland in 1927 by Heinonen. On the contrary, the 22% prevalence of myopic eyes in the age group of 14 years exceeded considerably the 14% prevalence found by Heinonen in this age group in 1934. Thus it seems that the incidence of myopia in late childhood has increased during the last decades. The reason for this cannot be ascertained on the basis of this study.

In the pathogenesis of myopia genetic factors (Sorsby *et al.* 1966) and the amount of accommodation (near work) (Richler and Bear 1980) have been considered the most important. The children examined were randomly selected representing all social classes. Therefore great differences in the genetic pattern of these two series cannot be expected. It is possible that the amount of near work had slightly increased in this age group although both series were composed of school children.

Another possible explanation for increased prevalence of myopia in late childhood is that increase in the axial length of the eye – uncompensated by correlated growth of the cornea and lens – is related to the greater and more rapid general growth of the children due to better nutrition and general health of the population. This is supported by earlier findings that myopia develops earlier in girls than in boys (Young *et al.* 1954; Sorsby *et al.* 1961; Goldschmidt 1968) although this was not confirmed in the present study. This theory could also explain at least part of the increase in the prevalence of myopia after the introduction of formal education in Eskimo and Amerind populations (Young *et al.* 1969; Woodruff and Samek 1977). Prematurity has also been considered as a cause of myopia. In this series low birth weight did not increase the prevalence of myopia.

Monocular myopia of mild degree was common but it was not found to disturb binocular vision significantly unless anisometropia of about 2 D was present. Thus it seems justified to leave mild monocular myopia in children uncorrected unless strabismus is present. Manifest strabismus was found in five of the 47 myopic children and one of them had mild amblyopia due to microstrabismus.

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THE DISTRIBUTION OF MYOPIA IN MAN AND MONKEY

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ABSTRACT

A recently published national probability sample of the refractive characteristics of the United States population 4–74 years indicates that adults 18–44 have the greatest amount of myopia. This distribution plus one taken in 1928 on Washington, D.C. school children six years and older are compared with refraction distributions of three groups of monkeys – wild, open space monkeys, laboratory caged monkeys, and near-visual space monkeys. The children and wild monkey distributions are virtually identical. The adults and laboratory caged monkeys are very similar. The near-visual space monkeys are significantly (0.01 level) more myopic than any of the other groups.

INTRODUCTION

For a number of years we have been examining the refractive characteristics of humans and sub-human primates when these groups have been subjected to different visual environments in the hopes of determining the relative contribution of heredity and environment to the development of myopia.

A considerable amount of data have been gathered on randomly selected monkeys placed in different visual environments such as (a) a near-point visual environment which restricts the monkey from seeing beyond 16- to 20- in. from the eyes through the use of translucent but not transparent cages; (b) standard laboratory cages in standard size laboratory rooms which effectively restricts the animal to an 8- to 10-ft distance visual environment and (c) the natural visual environment of wild monkeys. We have been able to examine a large group of monkeys which had just been imported from India into the United States as well as a group of Japanese Macaques. The latter had lived in an open area in Japan and were captured as a group and were transfered to Portland, Oregon, where they were again kept in very large open pens which permitted visual distances of more than 300 ft.

We have not been able to generate comparable data on human populations since all of the human groups we have studied such as the Eskimos in Barrow,

Doc. Ophthal. Proc. Series, Vol. 28,
ed. by H.C. Fledelius, P.H. Alsbirk and E. Goldschmidt
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