A longitudinal refractive error study of the Republic of Moldova

Christopher M. Putnam
Pacific University

David J. Kading
Pacific University

Recommended Citation
https://commons.pacificu.edu/opt/1451

This Thesis is brought to you for free and open access by the Theses, Dissertations and Capstone Projects at CommonKnowledge. It has been accepted for inclusion in College of Optometry by an authorized administrator of CommonKnowledge. For more information, please contact CommonKnowledge@pacificu.edu.
A longitudinal refractive error study of the Republic of Moldova

Abstract
The Republic of Moldova is located in southeastern Europe, on the northern border of Romania and the southwest border of the Ukraine. Moldova is composed of 4.5 million people of which, two-thirds are ethnic Moldovans. The remaining one-third of the population is made-up of people of Russian, Ukrainian, Gagauz, or Turkish decent. Over one-half of the population lives in rural communities and nearly the entire remaining portion resides in the capital of Chisinau (Kishinev). Our study was designed to take a cross-section of Moldovan individuals and assess their refractive error findings. Our test population numbered over 2400 individuals, allowing the study a fair amount of accuracy when extrapolating the data to represent the entire Moldovan population. Although refractive error trends followed expected patterns within respective age groups, the overall refractive error pattern showed a larger than normal hyperopic tendency. This tendency can be shown to be attributed to the large number of individuals over the age of 41. It is because of the hyperopic shift in the over 40 population that the mean of the data appears hyperopic

Degree Type
Thesis

Rights
Terms of use for work posted in CommonKnowledge.

This thesis is available at CommonKnowledge: https://commons.pacificu.edu/opt/1451
Copyright and terms of use

If you have downloaded this document directly from the web or from CommonKnowledge, see the “Rights” section on the previous page for the terms of use.

If you have received this document through an interlibrary loan/document delivery service, the following terms of use apply:

Copyright in this work is held by the author(s). You may download or print any portion of this document for personal use only, or for any use that is allowed by fair use (Title 17, §107 U.S.C.). Except for personal or fair use, you or your borrowing library may not reproduce, remix, republish, post, transmit, or distribute this document, or any portion thereof, without the permission of the copyright owner. [Note: If this document is licensed under a Creative Commons license (see “Rights” on the previous page) which allows broader usage rights, your use is governed by the terms of that license.]

Inquiries regarding further use of these materials should be addressed to: CommonKnowledge Rights, Pacific University Library, 2043 College Way, Forest Grove, OR 97116, (503) 352-7209. Email inquiries may be directed to: copyright@pacificu.edu

This thesis is available at CommonKnowledge: https://commons.pacificu.edu/opt/1451
A LONGITUDINAL REFRACTIVE ERROR STUDY
OF THE REPUBLIC OF MOLDOVA

By:

CHRISTOPHER M. PUTNAM

DAVID J. KADING

A thesis submitted to the faculty of the
College of Optometry
Pacific University
Forest Grove, Oregon
for the degree of
Doctor of Optometry
December 2003

Advisor:

Patrick Caroline C.O.T., F.A.A.O.
Authors:

Christopher M. Putnam

David J. Kading

Advisor:

Patrick Caroline C.O.T., F.A.A.O.
Abstract

The Republic of Moldova is located in southeastern Europe, on the northern border of Romania and the southwest border of the Ukraine. Moldova is composed of 4.5 million people of which, two-thirds are ethnic Moldovans. The remaining one-third of the population is made-up of people of Russian, Ukrainian, Gagauz, or Turkish decent. Over one-half of the population lives in rural communities and nearly the entire remaining portion resides in the capital of Chisinau (Kishinev).

Our study was designed to take a cross-section of Moldovan individuals and assess their refractive error findings. Our test population numbered over 2400 individuals, allowing the study a fair amount of accuracy when extrapolating the data to represent the entire Moldovan population.

Although refractive error trends followed expected patterns within respective age groups, the overall refractive error pattern showed a larger than normal hyperopic tendency. This tendency can be shown to be attributed to the large number of individuals over the age of 41. It is because of the hyperopic shift in the over 40 population that the mean of the data appears hyperopic.
Introduction

The purpose of this study is to create a prevalence cross-section of refractive errors and ocular health based on current research. Similar epidemiological studies have been performed on many populations.

This study focuses on refractive error prevalence found among Modolvan adults and children. The data can be compared against existing studies of eastern European populations as well as US populations to determine possible cultural influences impacting vision.

Past epidemiological studies focusing on refractive error tended to use a small number of individuals as a sample group. Other studies used past data as a comparison group rather current information. This study avoids both pitfalls by using a sample group of 2400 individuals obtained in March of 2002 and comparing this data with studies conducted after 1999.

Methodology

The compiled data was gathered during an Amigos Eyecare trip to Kishniev, Moldova. Each patient was given a basic case history including chief complaint, medical and ocular histories, current medications, allergies and drug allergies then tested for visual acuities, direct opthalmoscopy, and autorefraction. Current prescriptions were verified with an AO Instruments lensometer.

Near habitual visual acuities were taken at a distance of 16 in (40 cm). Distance habitual visual acuities were taken at a 10 ft (3m) testing distance and Snellen chart measurements were adjusted accordingly. Distance VAs were tested OD, OS, and OU
and near VAs were recorded as OU. Testing distance was adjusted as needed for poor VAs and recorded at that distance.

Posterior segment health was assessed using direct ophthalmoscopy techniques. Major points of interest included C/D ratio, A/V ratio, optic nerve margins and periphery. (maybe include acceptable ranges for each) No additional fundus examination was given for patients falling within normal ranges and acceptable deviations. Patients that were determined to have unusual findings or patients that were unable to be examined due to corneal opacities or other view limiting factor were referred to special testing in which a dilated fundus exam could be conducted.

The refractive error data was gathered with the use of a Nikon autorefractor or distance retinoscopy with the use of lens bars in one-half diopter increments. These refraction findings were then reviewed by an attending OD who determined if the findings were appropriate and, if needed, bifocal power based on age. The refraction findings were then taken to the dispensary where a corrective lens matching the prescription as closely as possible from an available lens library was then fitted for the patient. Known lensometer values were adhered to each pair of glasses and when dispensed, the values are kept with the intake form of the individual to whom the glasses were dispensed.

Acceptable corrective lenses were determined based partly on refraction results but to a larger degree, based upon distance and near subjective acuities of the patient. Tolerable lenses were fitted and then dispensed.
Refractive Distribution

The distribution of RE sphere resembles a typical Bell curve skewed slightly right towards myopia. The OD and OS sphere values have a nearly identical number of subjects within each category. The categories are broken down in the following: plano, 0.25D-0.75D, 1D-1.75D, 2D-2.75D, 3D-5.75D, 6D-9.75D, and 10D and greater. These categories apply to both hyperopia and myopia.

Of the 2404 subjects tested, the plano classification included 543 OD / 542 OS. The 0.25D-0.75D myopia subjects included 402 OD / 378 OS and the 1D-1.75D myopia group included 451 OD / 450 OS. The 2D-2.75D myopia individuals were 200 OD / 216 OS and the 3D-5.75D myopia group included 107 OD / 114 OS. The final two groups of 6D-9.75D myopia were 12 OD / 21 OS and greater than 10D of myopia included 10 OD / 5 OS.

The 0.25D-0.75D hyperopia subjects included 218 OD / 219 OS and the 1D-1.75D hyperopia group included 158 OD / 155 OS. The 2D-2.75D hyperopia individuals were 99 OD / 89 OS and the 3D-5.75D hyperopia group included 133 OD / 139 OS. The final two groups of 6D-9.75D hyperopia were 45 OD / 50 OS and greater than 10D of hyperopia included 26 OD / 26 OS.

Although the peak of the curve is skewed towards myopia, the bulk of the myopic subjects demonstrated low RE of less than 3D. Just over 89% of myopic individuals showed less than 3D of myopia.

The hyperopic individuals created a double curve due to higher amounts of very low hyperopia and increased amounts of moderate to high hyperopia. The is due to 32%
of subjects showed less than 1D of hyperopia while 30% showed more than 3D of hyperopia.

**Spherical Refractive Error**

The overall sphere refractive error (RE) of the Moldovan population sampled followed expected trends (cite source) as early hyperopia led to adolescent myopia increasing into early adulthood then reversing into increasing hyperopia. The OD and OS means and standard deviations within determined age values were calculated for the sample population of 2404 Moldovan subjects.

The OD spherical RE is as follows: Ages 0-10 show 0.19D of hyperopia with a 0.211 standard deviation (s.d.). Ages 11-20 show 0.52D of myopia with a 0.184s.d. Ages 21-40 show 1.32D of myopia with a 0.136s.d. Ages 41-50 show 0.03D of myopia with a 0.104s.d. Ages 51-60 show 0.49D of hyperopia with a 0.997s.d. Ages 61-90 show 0.83D of hyperopia with a 0.098s.d. The overall calculated OD spherical RE showed 0.03D of hyperopia with a 0.053s.d. Males demonstrated a spherical RE of 0.25D of hyperopia with a 0.104s.d. while females measured 0.04D of myopia with a 0.061s.d.

The OS spherical RE is as follows: Ages 0-10 show 0.26D of hyperopia with a 0.212s.d. Ages 11-20 show 0.53D of myopia with a 0.177s.d. Ages 21-40 show 1.28D of myopia with a 0.136s.d. Ages 41-50 show 0.02D of hyperopia with a 0.103s.d. Ages 51-60 show 0.48D hyperopia with a 0.097s.d. Ages 61-90 show 0.84D hyperopia with a 0.097s.d. The overall calculated OS spherical RE showed 0.06D of hyperopia with a 0.052s.d. Males demonstrated a spherical RE of 0.27D of hyperopia with a 0.103s.d. while females measured 0.02D of myopia with a 0.060 s.d.
Cylindrical Refractive Error

Astigmatism findings varied slightly from expected. Of the 2404 subjects examined, 1128 had some measurable cylinder refractive error OD while 1082 subjects had measurable cylinder OS. Three types of astigmatism were identified: with-the-rule (WTR), against-the-rule (ATR), and oblique astigmatism. The parameters for each type were defined as follows: WTR axis is within 0-30 degrees and 150-180 degrees, ATR axis is within 60-120 degrees, and oblique axis will fall within 31-59 degrees and 121-149 degrees.

Of these three categories, overall expected values of WTR statistically have a greater incidence followed by ATR and oblique with the least incidence. The OD astigmatism values were as follows: 487 WTR, 469 ATR, and 172 oblique. This breakdown closely shadows expected results of accepted incidence within a population. The OS astigmatism values, however, did not follow the trend as expected. The OS astigmatism values were as follows: 450 WTR, 472 ATR, 160 oblique. Although the greatest incidence of astigmatism OS was ATR rather than WTR, the values of each nearly paralleled one another in terms of overall incidence.

Conclusion

The large number of individuals in the study (2404) is large enough to extrapolate a mean refractive error representative of the Moldovan population. Expected trends are seen within age groups showing slight hyperopia 0-10 years of age, slight myopia developing in school age individuals 11-20, and increasing myopia in individuals 21-40 years of age. After the age of 40, a decrease in accommodative amplitude accompanied
by early cataract formation creates a hyperopic shift in 41-50 year olds. This hyperopic refractive error trend continues to increase throughout the 51-60 yearold age group and 61-90 year old age group.

Although the refractive error (RE) follows expected trends within age groups, the overall sphere RE shows a larger than expected hyperopic pattern. This pattern is unusual but can be explained due to the large number of individuals within certain age groups. Of the 2404 persons included in the test group, 66% were 41 years of age and older. Since this age group is typically hyperopic, the large percentage of hyperopic individuals skews the data.
Sphere Power in Diopters for Population

| Sphere in Diopters | >10 | -10 | -9 | -8 | -7 | -6 | -5 | -4 | -3 | -2 | -1 | 0 | 0.25 | 1.00 | 2.00 | 3.00 | 6.00 | >10 |
|-------------------|-----|-----|----|----|----|----|----|----|----|----|----|---|-----|-----|-----|-----|-----|-----|-----|
| OD sphere         | 26  | 45  | 133| 99 | 158| 218| 543| 402| 451| 200| 107| 12 | 10  |
| OS sphere         | 26  | 50  | 139| 89 | 155| 219| 542| 378| 450| 216| 114| 21 | 5   |
Sphere for Population and Gender

Mean Sphere

<table>
<thead>
<tr>
<th></th>
<th>Everyone</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>0.033985025</td>
<td>0.25</td>
<td>-0.039949749</td>
</tr>
<tr>
<td>OS</td>
<td>0.055956739</td>
<td>0.273670473</td>
<td>-0.018559464</td>
</tr>
</tbody>
</table>
Cylinder Power in Diopters for Population

<table>
<thead>
<tr>
<th>Diopters</th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;5</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>4-4.75</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>3-3.75</td>
<td>23</td>
<td>29</td>
</tr>
<tr>
<td>2-2.75</td>
<td>77</td>
<td>98</td>
</tr>
<tr>
<td>1-1.75</td>
<td>333</td>
<td>283</td>
</tr>
<tr>
<td>0.25-0.75</td>
<td>675</td>
<td>655</td>
</tr>
</tbody>
</table>
Mean Cylinder by Age

Cylinder in Diopters

<table>
<thead>
<tr>
<th>Age</th>
<th>0-10</th>
<th>11-20</th>
<th>21-40</th>
<th>41-50</th>
<th>51-60</th>
<th>61-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>0.46875</td>
<td>0.623646209</td>
<td>0.476839237</td>
<td>0.29462572</td>
<td>0.36130137</td>
<td>0.579292929</td>
</tr>
<tr>
<td>OS</td>
<td>0.503125</td>
<td>0.678700361</td>
<td>0.46253406</td>
<td>0.310940499</td>
<td>0.328767123</td>
<td>0.563131313</td>
</tr>
</tbody>
</table>
Mean Cylinder in Diopters for Population and Gender

<table>
<thead>
<tr>
<th></th>
<th>Population</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>0.446755408</td>
<td>0.50040783</td>
<td>0.42839196</td>
</tr>
<tr>
<td>OS</td>
<td>0.445507488</td>
<td>0.51141925</td>
<td>0.422948074</td>
</tr>
</tbody>
</table>