MYOPIA:

A MODERN YET REVERSIBLE DISEASE

Todd Becker
Ancestral Health Symposium
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MY STORY
TWO QUESTIONS

What causes myopia?

How can it be reversed?

Taipei Times: Singaporean students use iPads in a language arts class at Nanyang Girls’ High School on May 18, 2011
Myopia (nearsightedness) is a refractive defect of the eye, in which distant objects appear blurred because their images are focused in front of the retina, rather than on it.

Myopia is the most common refractive error of the eye and is becoming more prevalent. Severe myopia can lead to complications such as: retinal detachment, eye floaters, cataracts and macular degeneration.
MYOPIA HAS INCREASED GREATLY SINCE 1970


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IS IT CAUSED BY GENETICS …OR ENVIRONMENT?

<table>
<thead>
<tr>
<th>Genetic causation - evidence</th>
<th>Environmental causation - evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>• More correlated in identical twins than fraternal twins</td>
<td>• Large increase among aboriginal peoples after Western schooling</td>
</tr>
<tr>
<td>• More correlated between parents and children than “by chance”</td>
<td>• Correlation between myopia prevalence and academic achievement</td>
</tr>
<tr>
<td>• Gene mutations associated with severe myopia (SCO2)</td>
<td>• Experimental demonstration of defocus-induced ocular growth in animals</td>
</tr>
<tr>
<td>• Wide variation between different ethnic groups</td>
<td></td>
</tr>
<tr>
<td>• Asia: 70-90%</td>
<td></td>
</tr>
<tr>
<td>• Europe/America: 30-40%</td>
<td></td>
</tr>
<tr>
<td>• Africa: 10-20%</td>
<td></td>
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</tbody>
</table>

### MYOPIA AMONG DIFFERENT OCCUPATIONS

1883 survey of military recruits in Holland:

<table>
<thead>
<tr>
<th>Occupation before recruiting</th>
<th>Percent myopic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers and fishermen</td>
<td>2.45%</td>
</tr>
<tr>
<td>Handworkers (coarse work)</td>
<td>5.24%</td>
</tr>
<tr>
<td>Handworkers (fine work)</td>
<td>11.66%</td>
</tr>
<tr>
<td>Merchants</td>
<td>15.76%</td>
</tr>
<tr>
<td>Advanced students</td>
<td>32.38%</td>
</tr>
</tbody>
</table>

[http://www.myopia.org/ebook/10chapter5.htm](http://www.myopia.org/ebook/10chapter5.htm)
INTRODUCTION OF SCHOOLING TO ESKIMOS

Barrow Alaska study (1969)

Myopia Frequency in Eskimo Age Groups


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EFFECT OF EDUCATIONAL LEVEL IN GERMANY

Study of German students (2012)

Myopia increases with more education

Myopia increases with more education

Per cent with Myopia

Dropouts Vocational Secondary University

Education Completed

PREVALENCE IN DIFFERENT COUNTRIES

All about Myopia

Facts
A study done a few years ago by the Singapore National Eye Centre found that we have the highest prevalence of myopia in the world:

<table>
<thead>
<tr>
<th>Country</th>
<th>Age</th>
<th>Wearing Glasses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>7 to 9</td>
<td>34%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>7 to 9</td>
<td>19%</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>7 to 8</td>
<td>12%</td>
</tr>
<tr>
<td>USA</td>
<td>6 to 14</td>
<td>7.5%</td>
</tr>
<tr>
<td>Nepal</td>
<td>5 to 15</td>
<td>Less than 3%</td>
</tr>
</tbody>
</table>

Causes
- Excessive close work
- Lack of outdoor activity
- Poor illumination
- Size of print in books
- Poor eye-care
- Unhealthy diet

Prevention
- Remind children to have good reading habits
- Ensure adequate lighting
- Place monitor screen about 50cm away from eyes.
- Sit at least 2 meters away from the screen.
- Center of TV screen should be at eye level or lower.

http://osiminspiringlife.wordpress.com/2012/12/03/causes-and-prevention-of-myopia/myopia/

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We performed exome sequencing in 4 individuals from an 11-member family of European descent from the United States. Affected individuals had a mean dioptic spherical equivalent of -22.00 sphere.

SCO2 encodes for a copper homeostasis protein influential in mitochondrial cytochrome c oxidase activity. Copper deficiencies have been linked with photoreceptor loss and myopia with increased scleral wall elasticity.
DIET AND MYOPIA

Some studies implicate contribution to myopia from:

- Hyperinsulinemia and insulin resistance
- Excess intake of carbohydrate and whole grains
- Deficiency of fish oil / essential fatty acids
- Mineral deficiency or excess (Cu, Zn, Vn)

Cordain et al. (2002)

- Children in islands of Vanuatu have 8 hours of daily compulsory schooling.
- Rate of myopia in Vanuatu children is about 2%
- Vanuatuans eat fish, yam and coconut, and no bread or cereals.

# How Environment Acts on Genetics

<table>
<thead>
<tr>
<th>Environment</th>
<th>Genetics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Predisposed</td>
</tr>
<tr>
<td>Myopiagenic (education, near work)</td>
<td>Strong myopia</td>
</tr>
<tr>
<td></td>
<td>&gt; 2.0 diopters</td>
</tr>
<tr>
<td></td>
<td>&gt; 20/150 Snellen</td>
</tr>
<tr>
<td>Non-myopiagenic</td>
<td>No myopia</td>
</tr>
</tbody>
</table>

WHAT IS THE BIOLOGICAL MECHANISM?
THE NORMAL LENS CHANGES SHAPE TO FOCUS

Relaxed ciliary muscle

Distance focus

Contracted ciliary muscle

Close focus
HOW MYOPIA PROGRESSES

1. Near work

2. Minus lens

3. Eye elongation

4. Stronger minus

Normal vision

Pseudo myopia

Axial myopia

Distance "correction"

Spasm

Defocus
INCREMENTAL RETINAL-DEFOCUS THEORY (IRDT)

- Axial myopia is a consequence of incremental defocus induced by minus lenses
- Time-averaged incremental retinal defocus decreases the rate of release of neuromodulators responsible for retinal proteoglycan synthesis
- This decreases scleral tissue integrity, increasing scleral growth and the eye’s axial length

Repeated cycles of near-work transient myopia lead to an increase in axial growth that leads to permanent myopia.

Hyperopia results from the opposite process: Focusing in front of the retina induces the eye globe to grow shorter.


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PROOF OF THE IRDT THEORY

Demonstrated in chicks, monkeys...and most recently in humans!

28 adults
Eye length measured using optical reflectometry

HOW CAN MYOPIA BE REVERSED?
HORMESIS

• Hormesis is the beneficial response of an organism to a low dose stressor that is otherwise detrimental or lethal at high doses
• Hormesis works by activating defense or repair mechanisms
• The result is supercompensation and increased resilience to stressors

EXAMPLES:

Exercise
Immunization
Calorie restriction
Cold exposure
Heat exposure
UV radiation
Phytonutrients
Callus formation
Barefoot running
Active focusing
WEIGHT LIFTING IS A GOOD EXAMPLE OF HORMESIS

- Lifting heavy objects causes micro-trauma: damage and tearing of muscle fibers
- If performed prudently, muscle repair results in supercompensation and hypertrophy
- Optimal training occurs at “the edge of failure”

SAID Principle:

Specific Adaptation to Imposed Demand

HOW DOES THIS APPLY TO REVERSING MYOPIA?
WHAT IF GYMS HAD THE SAME BUSINESS MODEL AS OPTOMETRISTS?

CONCORD, Massachusetts, December 9, 2004 - Schilling Robotics, LLC, is using SolidWorks 3D mechanical design software to design critical parts of an “exoskeleton” that will someday help soldiers, firefighters, rescue workers, and others carry back-breaking burdens without feeling the weight.

The BLEEX consists of a backpack-like frame and mechanical braces connected to the user’s feet, legs, and hips.

Human users wearing the BLEEX can carry a 70-pound backpack yet feel as though they are carrying five pounds.
HORMESIS FOR THE EYES:
USING ACTIVE FOCUS TO REVERSE MYOPIA

While reading:
• Print pushing and plus lenses

For distance:
• Progressively weaker lenses
• Fusing ghosted images
# Measuring Myopia with a Snellen Chart

<table>
<thead>
<tr>
<th>Snellen (score)</th>
<th>Diopters (minus)</th>
<th>Distance (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/400</td>
<td>4.00</td>
<td>10</td>
</tr>
<tr>
<td>20/300</td>
<td>3.50</td>
<td>11</td>
</tr>
<tr>
<td>20/250</td>
<td>3.00</td>
<td>13</td>
</tr>
<tr>
<td>20/200</td>
<td>2.50</td>
<td>16</td>
</tr>
<tr>
<td>20/150</td>
<td>2.00</td>
<td>20</td>
</tr>
<tr>
<td>20/100</td>
<td>1.50</td>
<td>26</td>
</tr>
<tr>
<td>20/70</td>
<td>1.25</td>
<td>31</td>
</tr>
<tr>
<td>20/50</td>
<td>1.00</td>
<td>39</td>
</tr>
<tr>
<td>20/40</td>
<td>0.75</td>
<td>52</td>
</tr>
<tr>
<td>20/30</td>
<td>0.50</td>
<td>79</td>
</tr>
<tr>
<td>20/20</td>
<td>0.00</td>
<td>∞</td>
</tr>
</tbody>
</table>
PRINT PUSHING

With or without glasses

• If your correction is more than -2.00 D, *no glasses are needed*

• If your correction is less than -2.00 D, *use plus lenses*. Select plus lenses that allow you to read at 15-20” from screen or book

• When you have to sit more than 20” away, graduate to stronger plus lenses!

• Test your vision each week, using a Snellen chart at 20 feet in bright light

• Keep going until you reach your goal… 20/20 or even 20/15!
PRINT PUSHING

D1: Edge of focus

D2: Edge of blur

D3: Edge of readability
1. Move back from screen or book until you are at the edge of blur (D2)
2. Periodically blink and attempt to bring the print to the edge of focus (D1)
3. Read between D1 and D2, adjusting distance as necessary
4. Do this for 2-4 hours daily, taking breaks every 15-30 minutes
5. Increase distance until it exceeds 20”
6. Graduate to stronger plus lenses and repeat until you can read 20/20
DISTANCE: PROGRESSIVELY WEAKER LENSES

For distance activities, buy lenses that are progressively weaker by 0.5 diopters

Successively reduce in 0.5 diopter steps

- Walking
- TV
- Movies
- Meetings and lectures
- Riding as a passenger


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TAking Advantage of DiploPia

Sharp

Blurred

Ghosted

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FUSING GHOSTED IMAGES
HOW TO STRENGTHEN YOUR WEAKER EYE

Block the dominant eye in order to work the weaker eye:

patch  shield  wink
FREQUENTLY ASKED QUESTIONS

• How much time should I spend each day?
• How long before my vision improves?
• Is this the same as the Bates Method?
• Does this method really work?
HOW MUCH TIME SHOULD I SPEND ON THIS?

GUIDELINES

1. Print pushing and active focus are not “exercises” – integrate them into your routine
2. Spend at 2-4 hours daily print pushing (with plus lenses if myopia is less than -2.0 D)
3. Take breaks every 15-30 minutes. Alternate between looking at objects near and far.
4. Print pushing should feel “awkward” but never painful.
5. If you ever experience strain or redness, take a break for a day or two
HOW LONG BEFORE MY VISION IMPROVES?

MINDSET

• Be patient – it takes months to reverse a condition that was years in the making!
• Approach active focus the way you would any serious exercise, diet or lifestyle change
• Your motivation: Crystal clear distance vision without glasses or contacts!

TYPICAL RESULTS

1. Most people see some improvement within a few weeks
2. The rate of improvement is generally faster in the beginning, then slows
3. It is common to see no change for weeks, then sudden big improvements
4. The excitement comes when you start seeing sharp images in the distance!
IS THIS THE SAME AS THE BATES METHOD?

Bates was wrong about the physiology of myopia.

- He thought that the eye’s focusing mechanism was controlled by muscles surrounding the eye.
- We now know it is the ciliary muscle that changes only the shape of the lens.

Bates developed some relaxation techniques that might help reverse pseudo-myopia (ciliary strain) but probably do nothing for axial myopia.

Beyond Bates:

- Relaxation and distance viewing are great, but this is not very helpful advice for those of us who must spend a lot of time reading and at the computer.
- Active focusing at “the edge of blur” provides a way reverse myopia while reading!
DOES ACTIVE FOCUS REALLY WORK?

• It has worked for me... and for many others

• For success stories, check out gettingstronger.org: 1.3 million views
  • “Improve vision – and throw away your glasses”: 165,000 views
  • “Eyesight without glasses” on the Discussion Forum: 132,000 views
REFERENCES

Epidemiology

Biological Mechanism

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REFERENCES

Methods


Websites
• gettingstronger.org
• frauenfeldclinic.com
• myopiafree.com
• powervisionsystem.com
• myopiacure.blogspot.ca
SO....REDISCOVER YOUR NATURAL VISION

Your eyes are adaptive organs

- Years of closely reading books, computers and smart phones shorten your focal distance
- Progressively stronger lens prescriptions make the eye grow longer, increasing myopia

But you can use that same adaptability to reverse the process using active focus!

- Stimulate your eyes by spending time at the threshold between focus and slight blur
- Use plus lenses when reading close up, weakened prescriptions for distance
- Keep moving back to increase focal distance... use Snellen measurements to check progress!
- Take frequent time out from close up work to focus on distant objects
SO....REDISCOVER YOUR NATURAL VISION

Have fun with active focusing.

Build it into your daily life --
...make it a habit
...make it a game!

You only have your glasses to lose!

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QUESTIONS?


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