A longitudinal study of myopia progression in young adults and associated nearwork-induced transient myopia

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Introduction

The prevalence of myopia seems to be increasing as society moves towards an environment favouring near tasks. After a period of nearwork, many individuals show a slight transient myopic shift in their prescription. The average magnitude of this shift is 0.40 dioptres (D) and its decay has been reported to take from 30 seconds to a few hours to return to baseline[1]. For susceptible individuals this causes distance vision blur and is classed as nearwork-induced transient myopia (NITM).

It has been suggested that NITM may be associated with the onset and progression of permanent myopia[2].

The aim of this study was to monitor myopia progression in optometry students over a two year period and assess its association with both the symptoms of NITM and its objective measurement.

Methods

The following measurements were taken on 73 undergraduate optometry students in January 2008:

- Distance refractive error non-cycloplegic autorefraction (NVision-K 5001).
- Axial length (AL), corneal radius (CR) and anterior chamber depth (ACD) (IOL Master).

All measurements were repeated in January 2009 and January 2010.

Three questionaires were issued to participants asking details of:

- Personal and family refractive history and symptoms of NITM.
- Time spent undertaking nearwork, computer work and sporting activities.
- Ethnic origin and symptoms of NITM.

Objective measurements of NITM were carried out on 16 of the participants. Continuous accommodation measurements were taken during a 1 minute 3 D near task and for 90 seconds post task at 0 D. The average level of NITM and the percentage regression were calculated for 10, 20 and 30 seconds post task.

Analysis was carried out on results from the right eye only. Emmetropia = mean spherical equivalent > -0.50 D and < +0.50 D.

Data from full cohort

- 73 optometry students.
- Age range 18 – 38.
- 31 male and 42 female.
- Ethnic origin Asian (58 %), White (31 %), other (11 %): (mixed race, African, Caribbean or Bangladeshi) .

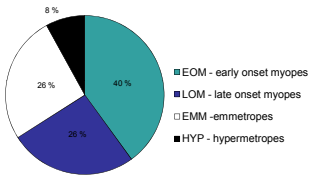

Figure 1. Prevalence of myopia in optometry students.

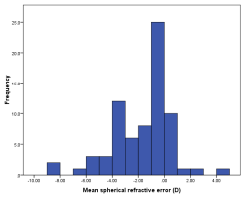

Figure 2. Distribution of refractive errors in optometry students.

Ocular component	Year 1	Year 3	P value
MSE (D)	-1.69 ± 2.28 -0.93 (-8.56 to +4.81)	-1.80 ± 2.34 -1.00 (-8.56 to +5.19)	0.006
AL (mm)	24.20 ± 1.18	24.26 ± 1.12	0.000
MCR (mm)	7.77 ± 0.26	7.75 ± 0.25	0.004
ACD (mm)	3.69 ± 0.26	3.65 ± 0.27	0.147
AL/CR	3.12 ± 0.15 3.10 (2.79 to 3.66)	3.13 ± 0.15 3.11 (2.79 to 3.67)	0.000

Mean group value of ocular components measured at the first and third data points with corresponding p values from paired t-tests to compare the change.

Subjective NITM data

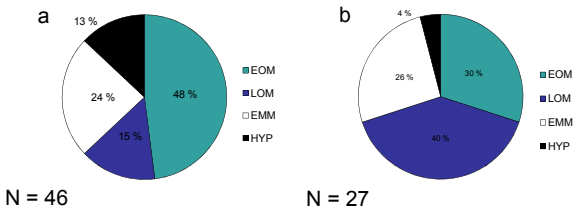

Figure 3. Pie charts showing myopia prevalence in those who did not notice symptoms of NITM (a) and those who did (b).

	Non-NITM	NITM	P value
Year 1 Rx (D)	-1.97 ± 2.60 -1.47 (-8.56 to 4.81)	-1.34 ± 1.67 -0.81 (-5.93 to 1.00)	
Year 1 AL (mm)	24.23 ± 1.26	24.17 ± 1.07	
Rx progression (D)	-0.10 ± 0.33 -0.10 (-0.87 to 0.44)	-0.17 ± 0.30 -0.06 (-0.94 to 0.19)	0.493
AL growth (mm)	0.05 ± 0.09	0.07 ± 0.11	0.343

Myopia progression and axial length change in non-NITM and NITM groups with corresponding *p* values from independent samples t-tests to compare the change.

Objective NITM data

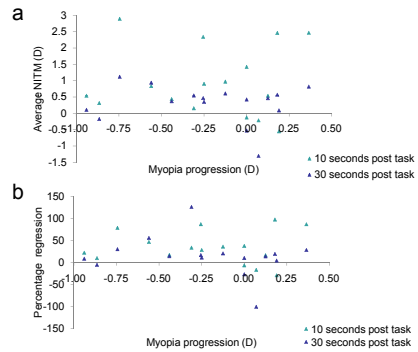

Figure 4. Scatterplots to show myopia progression over a two year period plotted against level of NITM (a) and percentage regression of NITM (b) for 2 - 10 seconds and 21 - 30 seconds post task.

Conclusions

LOMs appear to be more likely to suffer NITM symptoms than EOMs. There is a trend for those who suffer symptoms to have greater myopia progression and AL growth than those who do not. Myopia progression does not appear to be correlated with magnitude of NITM or regression of NITM at 2 - 10 or 21 - 30 seconds post task.

References

1.Ong, E. & Ciuffreda, K.J., *Doc. Ophthal.,* 1995 ; **91**: 57-85.

2.Vera-Diaz, F.A., Strang, N.C.& Winn, B., *Cur. Eye Res.,*2002. ; **24**: 289-295.

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EFFICACY OF SYSTEMIC 7-METHYLXANTHINE IN PREVENTING MYOPIA PROGRESSION

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Purpose-- Results from a clinical trial (ClinicalTrial.gov NCT00263471) have indicated that treatment with the non-selective adenosine antagonist 7-methylxanthine (7-MX) reduces axial eye growth in myopic children aged 8-13 years. Treatment with 7-MX is now available to Danish myopic children. The purpose of the study is to establish a data-base that allows evaluation of treatment results in individual patients.

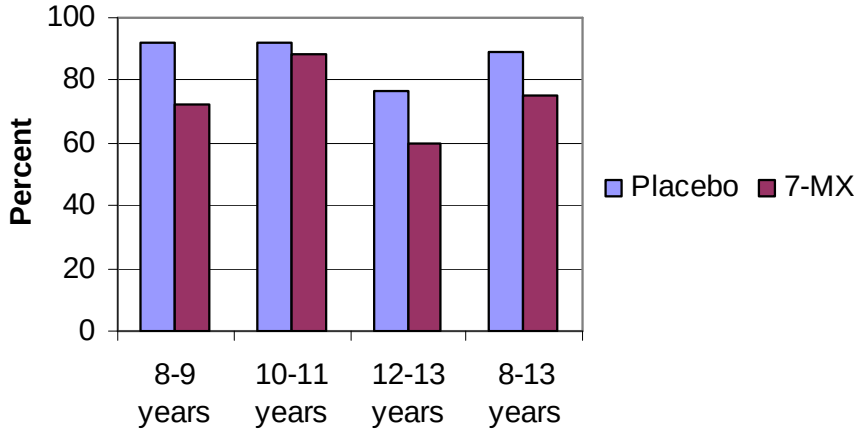
Methods-- Data from the trial supplemented with treatment data obtained later were analyzed. The change in axial growth rate induced by treatment with 7-MX or placebo in different age-groups were compared (n=103). The percentages of children with stable myopia (<0.25 diopters progression per year) and normal axial eye growth rate (<0.15 mm axial eye growth per year) in age-matched groups receiving either placebo (n=29), 7-MX/first year (n=81), or 7-MX/second year (n=32) were compared.

Results-- The axial eye growth rate dropped by 28%, 12%, and 40% in the first year of treatment with 7-MX (400 mg per day) in myopic children aged 8-9 years, 10-11 years, and 12-13 years, respectively. In age-matched myopic children treated with placebo, it dropped less: 8% (p=0.247), 8% (p=0.177), and 23% (p=0.463). For all age groups, the average drop among children treated with 7-MX was 25%, compared with 11% among children treated with placebo (p=0.029).
Among myopic children aged 10-13 years, 17% had stable myopia when treated with placebo, compared with 25% (p=0.606) and 47% (p=0.016) when in the first and second year of treatment with 7-MX, respectively. Correspondingly, 14% of those treated with placebo had a normal axial growth rate, compared with 25% (p=0.298) and 44% (p=0.013) of those who were in the first and second year of treatment with 7-MX, respectively.

Conclusion-- The fall in axial growth rate with time is greater, and the frequency of stable myopia and normal axial growth rate higher among myopic children treated with 7-MX than among age-matched myopic children treated with placebo.

Statement on proprietary interests-- Klaus Trier: US patent 6,710,051 and Canadian patent 2,276,287

Axial growth rate in first year of treatment relative to pre-treatment level in different age groups



Percentage of myopic children aged 10-13 years with stable myopia and normal axial growth rate