

## Prevalence of Myopia and its Association with School Environments among Primary School Children in Macau

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## Background

- In East Asian cities, the onset of myopia is now early, with a prevalence of more than 20% in the early primary school years resulting in a prevalence of myopia in young adults of more than 80%
- An increasing proportion (approx 20%) of young adults with high myopia.
- Increased risk of cataract, retinal detachment, macular degeneration and open angle glaucoma later in life
- Uncorrected myopia is a major public health problem among children

## Background

- **Marked increase of myopia in some populations and marked differences between those living in the urban and rural areas imply environmental risk factors**
- **Macau school children live in highly congested environments and spend long hours in school**
- **Whether and how school environments relate to myopia of Macau school children are unclear**

## Objectives

- **To assess the prevalence of myopia and its associated school environments among Macau school-aged children**

## Method

- **Myopia: defined as spherical equivalent refraction (SER) of  $\leq -0.5$  diopters (D)**
- **School Environments (14 items):**
  1. Weekly Sports Hours
  2. Daily Eye Exercises
  3. Annual Eye Health Education
  4. Annual Visual Examination
  5. Brightness of Whiteboard
  6. Brightness of Classroom
  7. Hours of Classes Per Day
  8. Nearest Distance from the Whiteboard of Student Seats
  9. Furthest Distance from the Whiteboard of Student Seats
  10. Daily Class Hours
  11. Tests during recess
  12. Types of Lighting
  13. Types of White Boards
  14. Seating Changes

## Method

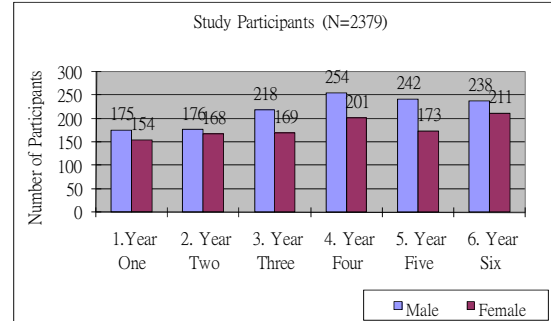
- **Design: Cross-sectional study of school children selected using a random stratified cluster design**
- **Participants: 2379 of year 1 to 6 children from 84 classes of 14 Macau schools**

## Method

- **Methods:** Children had non-cycloplegic autorefraction (model NIDEK ARK 700A) as well as subjective refraction for visual acuity examination.

Self administered questionnaires were completed by teachers on school activity. Other school environments such as class room brightness and distance of seating were actually measured.

## Results



## Results

**Prevalence of Myopia among Macau Children of Different Gender**

			Male	Female	Total
Myopia	No	N	841	692	1533
		%	64.5%	64.4%	64.5%
	Yes	N	462	383	845
		%	35.5%	35.6%	35.5%
Total		N	1303	1075	2378
		%	100.0%	100.0%	100.0%

$\chi^2 (1, N = 2378) = 0.008, p = .931$

## Results

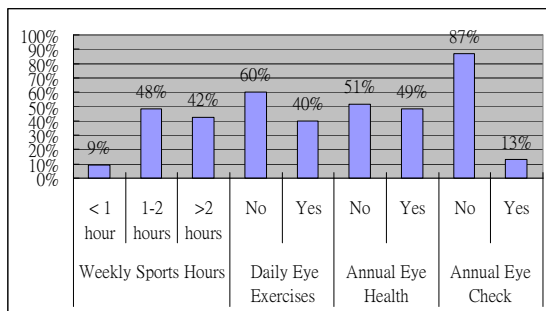
**Prevalence of Myopia among Macau Children of Different School Years**

			Year One	Year Two	Year Three	Year Four	Year Five	Year Six	Total
Myopia	No	N	274	265	267	275	222	230	1533
		%	83.30	77.30	69.00	60.40	53.50	51.20	64.50
	Yes	N	55	78	120	180	193	219	845
		%	16.70	22.70	31.00	39.60	46.50	48.80	35.50
Total		N	329	343	387	455	415	449	2378
		%	100.00	100.00	100.00	100.00	100.00	100.00	100.00

$\chi^2 (5, N = 2378) = 138.21, p < .001$

## Results

**School Environments I**



## Results

**Myopia and School Environments**

		Weekly Sports Hours			Daily Eye Exercises		Annual Eye Health Education		Annual Eye Check		Total	
		< 1 hour	1-2 hours	> 2 hours	No	Yes	No	Yes	No	Yes		
Myopia	No	N	117	756	660	895	638	737	796	1296	237	1533
		%	53.40	65.70	65.40	62.30	67.80	60.40	68.80	62.80	75.20	64.50
	Yes	N	102	394	349	542	303	484	361	767	78	845
		%	46.60	34.30	34.60	37.70	32.20	39.60	31.20	37.20	24.80	35.50
Total		N	219	1150	1009	1437	941	1221	1157	2063	315	2378
		%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

$\chi^2 (2, N = 2378) = 12.982, p = .002$      $\chi^2 (1, N = 2378) = 7.557, p = .006$      $\chi^2 (1, N = 2378) = 18.466, p < .001$      $\chi^2 (1, N = 2378) = 18.393, p < .001$

## Results

### Myopia and School Environments

	Myopia	N	Mean	SD	Std. Error Mean
Brightness (LUX) of Classroom ( $t=3.74, p<0.001$ )	No	1533	494.54	212.30	5.42
	Yes	845	461.21	198.75	6.84
Nearest Distance from the Whiteboard of Student Seats ( $t=-2.316, p=0.021$ )	No	1533	170.25	45.47	1.16
	Yes	845	174.66	42.44	1.46
Furthest Distance from the Whiteboard of Student Seats ( $t=-3.35, p=0.002$ )	No	1533	559.50	88.78	2.27
	Yes	845	571.49	88.75	3.05

## Results

### Binary Logistic Regression Model (forward conditional) of School Factors in Predicting Myopia

	OR	95.0% C.I. for OR		Sig.
Sports Time				.021
<1Hour	1.501	1.106	2.037	.009
1-2 Hours	1.182	.979	1.428	.082
School Year				.000
Year One	.218	.154	.308	.000
Year Two	.310	.225	.427	.000
Year Three	.459	.344	.613	.000
Year Four	.682	.523	.889	.005
Year Five	.940	.718	1.231	.655
Daily Eye Exercises	1.201	1.004	1.437	.045
Constant	.752			.017

## Results and Discussion

### Accuracy of the Binary Logistic Regression Model of School Factors in Predicting Myopia

Observed		Predicted		Percentage Correct
		Myopia No	Myopia Yes	
Myopia	No	1434	99	93.5
	Yes	703	142	16.8
Overall Percentage				66.3

## Conclusions

- The prevalence of myopia is high among school children of Macau
- School year, sports/ extracurricular activities time per week, daily eye exercises, eye health education, annual visual examination and classroom brightness are statistically associated with the prevalence of myopia
- Higher school year, less than an hour sports/ extracurricular activities per week and no daily eye exercise post significantly higher risks of myopia to the school children