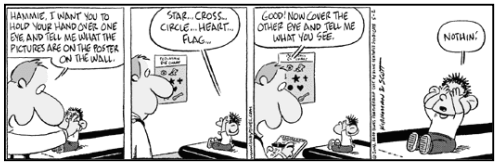


How often are spectacles prescribed to "normal" children?

Raymond H. Chu, OD, MS, FAAO
Chief, Pediatric Vision Care Center

JAAPOS 2004;8:224-229

Tennessee Lions Statewide Preschool Screening Program (Est. June 1997)

- MTI photoscreener (Vanderbilt Ophthalmic Imaging Center)
- 102,508 children (ages 1-5 years) June 1997 - April 2003
- 3,640 referrals with completed examination
- 890 (24.5%) false-positive exams (no amblyogenic factors)

JAAPOS 2004;8:224-229

TABLE 3. Spherical equivalent refractive error for children without amblyogenic factors who were prescribed glasses

	Spherical Equivalent Refractive Error						
	Myopia		Hyperopia				
Type of Doctor	≥1D	0-<1D	0-1D	>1-2D	>2-3D	>3-3.50D	Total
Optometrist	4	4	19	44	49	25	145
Comprehensive Ophthalmologist	3	2	6	4	7	2	24
Pediatric Ophthalmologist	1	0	1	0	2	1	5
Total	8	6	26	48	58	28	174

Dr. Mutti Letter to the Editor (JAAPOS June 2005): After pooling cells to perform a meaningful 2 analysis, 46.0% (63/137) of hyperopic spectacle prescriptions were written by optometrists when refractive error was between 0.00 D and 2.00 D compared with 47.8% (11/23) by ophthalmologists (P=0.87).

JAAPOS 2004;8:224-229

TABLE 4. Frequency of prescribing glasses in the absence of refractive or other pathology

Type of Doctor	Number of Examinations	Glasses Given	Percentage
Optometrist	413	145	35.1%
Comprehensive Ophthalmologist	205	24	11.7%
Pediatric Ophthalmologist	272	5	1.8%
Total	890	174	19.6%

Conclusions: While some preschoolers without amblyogenic factors may require spectacle correction, a significant percentage of children are probably prescribed glasses unnecessarily. Extrapolation of these data to the US population suggests that a single mandatory eye examination prior to school entry could cost over $200,000,000 yearly for unnecessary spectacles.

OVS 2004; 81(4): 233-237

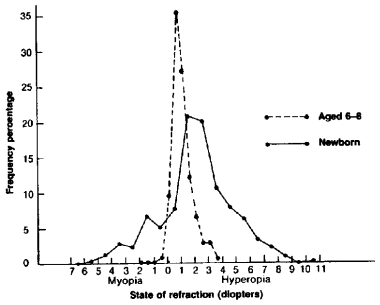
Pediatric optometry and pediatric ophthalmology: prescribing thresholds for hyperopia

Amount of bilateral hyperopia	6 mo old		2 yr old		4 yr old	
	OD (%)	MD (%)	OD (%)	MD (%)	OD (%)	MD (%)
>1.00 D	2.5	0	7.0	0	22.1	0
>3.00 D	30.4	3.6	64.6	25.0	67.1	42.1
>5.00 D	53.1	62.5	25.3	66.1	9.5	54.4
>7.00 D	10.8	26.8	2.5	5.4	0	1.8
>9.00 D	3.2	7.1	0.6	3.6	1.3	1.8

OD, optometrist; MD, ophthalmologist; D, diopter.
Modified from Lyons SA et al.[3]

Emmetropization

Am J Ophthalmol 1951;34:1407-13



Arch Ophthalmol 2001;119:1625–8.

TABLE 3.
Refractive error in children ages 1 to 48 months

Age (mo)	Spherical equivalent (D)[a]	95% prediction limits (D) Upper	Lower
1	+2.20 ± 1.60	+5.51	−1.12
1.5	+2.08 ± 1.12	+4.36	−0.20
2.5	+2.44 ± 1.32	+5.13	−0.26
4	+2.03 ± 1.56	+5.21	−1.16
6	+1.79 ± 1.27	+4.39	−0.81
9	+1.32 ± 1.13	+3.63	−0.99
12	+1.57 ± 0.78	+3.16	−0.01
18	+1.23 ± 0.91	+3.09	−0.64
24	+1.19 ± 0.83	+2.89	−0.50
30	+1.25 ± 0.89	+3.07	−0.57
36	+1.00 ± 0.76	+2.56	−0.56
48	+1.13 ± 0.85	+2.89	−0.62

[a]Values are expressed as mean ± SD.
Modified from: Mayer et al.[27]

OVS 2001;78:215–22

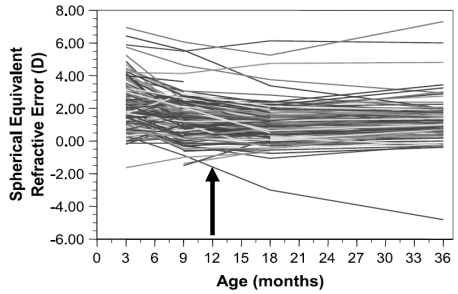
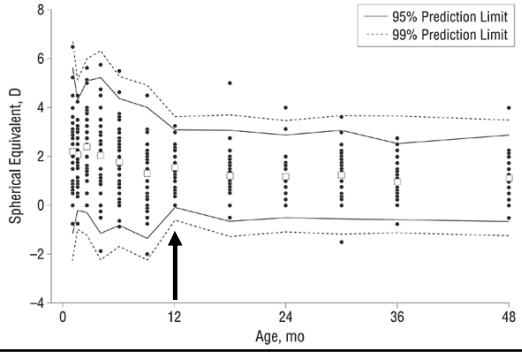


FIGURE 1.
Spherical equivalent refractive error as a function of age (3, 9, 18, and 36 months) in the BIBS study.

Arch Ophthalmol. 2001;119:1625-1628



Vision Res. 1995 May;35(9):1313-24

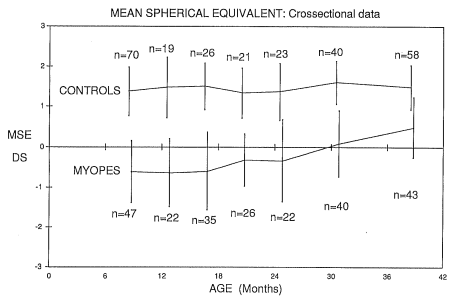


FIGURE 3. A cross-sectional plot of the myopic and control groups' mean spherical equivalent refraction with age, from 8.5 months to 38.5 months of age. The variable number of infants at each of the visits was due to variable attendance. Each point represents the mean ± 1 SD.

Arch Ophthalmol. 2001;119:1625-1628

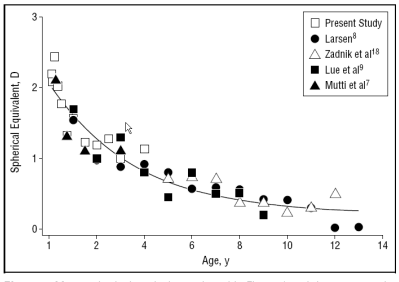


Figure 4. Mean spherical equivalents plotted in Figure 1 and those reported in Mutti et al,[7] Larsen,[8] Lue et al,[9] and Zadnik et al.[18] The smooth curve is a simple exponential function (time constant, 3.6 years) fit to all of the plotted points. D indicates diopters.

ATKINSON VS INGRAM

Atkinson et al. Eye 1996;10:189-98.	Ingram et al. BJO 1990;74:158-159
7 to 9-month-old infants Under-corrected sphere by 1.00 D and half the cyl	12-month-old infants Under-corected by 0.25 D
8.8% of the 68 treated became strabismic by 3.5 years, as opposed to 23.2% of the 56 mon treated subjects	13% of 152 subjects in treated group developed strabismus by 3.5 years, compared to 18% of 154 subjects not treated (p=0.17)

OVS 2004; 81(10):753–761

Astigmatism by age, amount, and orientation

	Amount	3 mo (n=262)	9 mo (n=243)	18 mo (n=257)	36 mo (n=220)
WTR	<1.00	37.8	41.2	26.9	43.4
	≥1.00	37.0	9.9	3.1	0.9
ATR	<1.00	11.1	30.9	46.7	23.5
	≥1.00	2.7	3.7	4.3	3.2
Oblique	<1.00	3.4	1.2	0.4	0.9
	≥1.00	1.9	0.8	0.4	0
Non Astig		6.1	12.4	18.3	28.1

Treatment of Anisometropic Amblyopia in Children with Refractive Correction

Ophthalmology 2006; 113(6):895-903

National Eye Institute
NATIONAL INSTITUTES OF HEALTH

Ophthalmol 2006; 113(6):895-903

- Prospective multi-center observational study
- Visual acuity measured with optimal spectacle correction at baseline and 5-week intervals until visual acuity stabilized or amblyopia resolved
- Main outcome measures:
  - Maximum improvement in best-corrected visual acuity in amblyopic eye
  - Proportion of children whose amblyopia resolved (IOD ≤ 1 line) with refractive correction alone

Ophthalmol 2006; 113(6):895-903

- Age 3 to < 7 years
- Anisometropic amblyopia (pure); no measured strabismus
- No prior spectacle wear or other treatment for amblyopia
- Anisometropia of ≥0.50 D sph eq and/or ≥1.50 D difference between eyes in astigmatism
- Amblyopic eye: 20/40 to 20/400
- Sound eye: ≥ 20/40
- IOD: ≥ 3 logMAR lines

Amblyopic Eye Acuity at Baseline

20/250	**1%**
20/200	**2%**
20/160	**6%**
20/125	**12%**
20/100	**15%**
20/80	**19%**
20/63	**23%**
20/50	**11%**
20/40	**11%**

Mean amblyopic eye acuity: 0.60 logMAR (20/80)

Mean IOD: 5.6 lines

Amount of Anisometropia (sph eq)

0.50 to <1.00D	9%
1.00 to <2.00D	14%
2.00 to <3.00D	16%
3.00 to <4.00D	30%
≥4.00D	32%

Mean (SD) : 3.21 (1.46)

PRESCRIBING METHODS

- Prescription based on a cycloplegic refraction using cyclopentolate 1%.
- Anisometropia, astigmatism, and myopia were corrected fully.
- Hyperopia >3.00 D of SE was fully corrected or symmetrically undercorrected by no more than 1.50 D in both eyes.
- Hyperopia ≤ 3.00 D of SE was corrected at investigator discretion.

Ophthalmol 2006; 113(6):895-903

- Refractive correction with spectacles alone improves visual acuity in many cases and results in resolution in at least 1/3 of 3 to <7 year old children with previously untreated anisometropic amblyopia
- Mean improvement is ~ 3 logMAR lines
- Most cases of resolution occur with moderate amblyopia

Treatment of Bilateral Refractive Amblyopia in Children 3 to <10 Yrs. of Age

Am J Ophthalmol 2007;144(4):487–496

Am J Ophthalmol 2007;144(4):487–496

- Prospective multi-center cohort study
- Visual acuity measured with optimal spectacle correction at baseline and 5, 13, 26, and 52 weeks after the baseline examination.

Amblyopic Eye Acuity at Baseline

	n (%)
>20/320	**0 (0)**
20/200 - 20/320	**3 (3)**
20/100 - 20/160	**16 (14)**
20/63 - 20/80	**38 (34)**
20/40 - 20/50	**56 (50)**

Mean amblyopic eye acuity: 0.50 logMAR (20/63)

Type of Bilateral Refractive Amblyopia

	n (%)
Significant hypermetropia only	40 (35)
Significant astigmatism only	46 (41)
Both significant hypermetropia and astigmatism	18 (16)
Mixed†	9 (8)

PRESCRIBING METHOD

- Prescription based on a cycloplegic refraction using cyclopentolate 1%.
- Anisometropia, astigmatism, and myopia were corrected fully.
- Hyperopia was fully corrected or symmetrically undercorrected by no more than 1.50 D in both eyes.

Binocular acuity at one year

	All patients	**Baseline 20/40-20/80**	**Baseline 20/100-20/320**
Mean Logmar [Sn], SD	0.11 [20/25], (0.13)	0.09 [20/25], (0.12)	0.18 [20/32], (0.16)
Binocular acuity 20/25 or better n (%)	79 (74)	70 (78)	9 (55)

Binocular Visual Acuity

	No. of Lines of Improvement at One Year (p=<0.001)
20/40 to 20/50	3.1
20/60 to 20/80	3.9
20/100 to 20/320	6.3

Am J Ophthalmol 2007;144(4):487–496

- Treatment of bilateral refractive amblyopia with spectacle correction improves binocular visual acuity in children three to less than 10 years of age, with most improving to 20/25 or better within one year

HYPEROPIA PRESCRIBING CONSIDERATIONS

- Hyperopia co-existing with esotropia / amblyopia
- Asthenopia
  (e.g. frequent blinking, HA, avoidance of near tasks, poor academic performance)
- Neurodevelopmental delays
  (e.g. Down Syndrome, CP)
- Reduced visual acuity
- Accommodative dysfunction / demand
- Vergence dysfunction / demand

PRESCRIBING METHOD

- Prescription based on a cycloplegic refraction using cyclopentolate 1%.
- Anisometropia, astigmatism, and myopia were corrected fully.
- Hyperopia was fully corrected or symmetrically undercorrected by no more than 1.50 D in both eyes.

SUMMARY

"Our treatment decisions regarding the management of hyperopia (regardless of the degree of the ametropia) should not be based on economic factors or on philosophies that have no scientific basis. It is time for serious investigation."

–Jerry Rosner, OVS 2004;81(4):223-224