

## Original Article

# Amblyopia Treatment Knowledge Cognition of Iranian Practitioners in 2012

Zhale Rajavi<sup>1</sup>, Masomeh Kalantarion<sup>1\*</sup>, Bahareh Kheiri<sup>1</sup>, Shadi Akbarian<sup>1</sup>, Pegah Farzam<sup>1</sup>

<sup>1</sup>Ophthalmic Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

## Abstract

**Background:** Amblyopia is considered as one of the most prevalent vision problems in pediatrics age (1-5%). Recently, new methods in amblyopia treatment were reported in Amblyopia Treatment Study (ATS'). The objective of this study was to recognize amblyopia treatment knowledge of Iranian ophthalmologists and optometrists which are responsible for amblyopia treatment in our and other countries.

**Materials and Methods:** This cross sectional study was performed during the Iranian Society of Ophthalmology annual meeting in Tehran in 2012 through questionnaire containing demographic information and 20 closed-answer questions based on ATS results. The questions were classified into seven categories and the sum of correct scores was 100. Optometrists and pediatric ophthalmologists were considered as the group 1 (153 participants), other practitioners (general ophthalmologists and other subspecialists) were regarded as the group 2 (256 participants). Criteria for inadequate, fair and good knowledge were considered by scores of < 50, 50 to 70, and >70 respectively.

**Results:** Overall, 409 out of a total of 600 questionnaires were completed (response rate: 68.1%). Mean scores of the group 1 were significantly higher than the group 2 in all 7 categories of questions and in 5 of them the differences were statistically significant. The worst and best scores were related to prescription of atropine (12%) and visual acuity improvement with glasses alone (93%), respectively. Scores for other questions were about 50%. There was no relationship between practice status and the number of referral amblyopic cases per week with the level of knowledge. In all categories except prescription of Atropine and recurrence, mean scores of females were more than the male participants.

**Conclusion:** knowledge about amblyopia therapy seems to be overall inadequate and should be improved by more education. We suggest paying more attention to new modified methods of amblyopia treatment and increased discussion of such method in annual and CME meetings.

**Keywords:** Amblyopia, Iran, Treatment

---

\*Corresponding Author: Masomeh Kalantarion. Ophthalmic Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Tel: +98-21-22591616, Fax: +98-21-22590607; Email: kalantarion@yahoo.com

Please cite this article as: Rajavi Zh, Kalantarion M, Kheiri B, Akbarian Sh, Farzam P. Amblyopia Treatment Knowledge Cognition of Iranian Practitioners in 2012. Novel Biomed. 2015; 3(1):13-9.

## Introduction

Amblyopia or “lazy eye” has been considered as one of the most prevalent vision problems in pediatrics and its incidence has been reported to be 1-5% in

various populations, equivalent to 70-350 million people globally<sup>1-8</sup>. Anisometropia, strabismus, and visual deprivation are recognized as the main reasons leading to reduced vision<sup>4,5</sup>. The main goal in amblyopia treatment is to improve non dominant eye

vision through sending a clear image simultaneously for both eyes. This is available through one or a combination of methods including: refractive error corrections, different types of occlusion using patch, filters or penalization, and surgical alignment and continuous follow up appointments during and after treatment at least up to 10 years old<sup>5,6</sup>. The prognosis of amblyopia treatment depends strongly on the patient's age, etiology, severity and duration of amblyopia, and effectiveness of the previous treatment's<sup>5-7</sup>.

Nowadays, there are still many children who remain undiagnosed due to low sensitivity of amblyopia screening tests; however, the problem could be completely solved if the amblyopic child is diagnosed before the age of six<sup>5</sup>. Treatment of older children usually are more difficult and all affect patients must be treated regardless of their age<sup>7</sup>. In recent years, many worthwhile studies have been carried out with the standard and correct methodologies in relation to the result of glasses prescriptions, comparing efficacy of occlusion with penalization method, and evaluating treatment benefits in older ages. Such studies titled "Amblyopia Treatment Study" (ATS) have been performed on 1 to 17 items and the results of the first ten have been published, and others are under investigation<sup>9-20</sup>. Awareness of ATS' results and following them should be the first priority of all optometrists and pediatric ophthalmologists, as they are directly responsible for amblyopia treatment. Other fellowships also need to know the results of these studies since the possibility of referring amblyopic children to them exists, especially in the rural areas.

Although ATS' recommendations have been published many practitioners do not follow them and treat their amblyopic patients with older methods.

The aim of this study was to recognize amblyopia treatment knowledge of Iranian practitioners by responding to a questionnaire which was designed according to ATS' results. If their amblyopia treatment knowledge scores were not acceptable, they should become more familiar with new methods of treatments through planning CME courses focusing on updates of amblyopia management.

## Methods

This cross sectional study was performed during the 22nd Iranian annual congress of ophthalmology held by Tehran University of Medical Sciences in Tehran capital city of Iran on November 2012 and analysis this data in April 2013. The Ethics Committee of the Ophthalmic Research Center approved the study. Due to lack of insurance referral system in amblyopia treatment, amblyopia patients have been treated by ophthalmologists and optometrist according to their preference.

Ophthalmologists and optometrists from all provinces of Iran participated. They were asked to answer a nameless questionnaire containing their demographic information and 20 closed answer questions based on ATS' recommendations. Participants were selected sequentially. 600 questionnaires were distributed among participants at baseline, and at the end of the study 409 questionnaires were completed.

**Questionnaire:** The questionnaire included questions about the age, gender, province and period of practice, the last educational degree, practice status, amount of patching in different intensities of amblyopia, first choice of amblyopia treatment, patch or atropine in (moderate, severe, bilateral refractive amblyopia), methods of treatment in 7-12 and 13-17 year-old children, the impact of supplementary methods including one hour daily near/far work, cut-off trends and recurrent percentage rate. The choice "I do not know" was considered when any question had no answer. In order to improve the response rate, some small gifts were given to all participants. The lists of participants were also compared to the former prepared list of total ophthalmologists and optometrists to prevent repeated replies. Validity and reliability were measured with Cronbach's  $\alpha$  coefficient.

Sum of the correct scores of 20 questions was equal to 100. Criteria for inadequate, fair and good knowledge were considered by scores of <50, 50 to 70 and >70, respectively.

Participants were classified into 2 groups according to their education in relation to amblyopia treatment. Optometrists and pediatric ophthalmologists (153 participants) whose education is directly in line with amblyopia treatment were considered as group 1, and

**Table 1:** Epidemiologic Characteristics of Participants.

		N (%)
<b>Sex</b>	Total	397 (100.0)
	Male	255 (64.2)
	Female	142 (35.8)
<b>Age Categories (years)</b>	Total	360 (100.0)
	<=40	187 (51.9)
	>40	173 (48.1)
<b>Province of Practice</b>	Total	397 (100.0)
	Capital	193 (48.6)
	Non Capital	204 (51.4)
<b>Educational Degree</b>	Total	409 (100.0)
	Optometrist + Fellowship Strabismus	153 (37.4)
	Other fellow +General Ophthalmologist	256 (62.6)
<b>Practice status</b>	Total	363 (100.0)
	Faculty	70 (19.3)
	Non-Faculty	293 (80.7)
<b>Number of referral Amblyopia (weekly)</b>	Total	419 (100.0)
	<=3	221 (52.7)
	>3	198 (47.3)
<b>Duration of Practice (years)</b>	Total	372 (100.0)
	<=10	178 (47.8)
	>10	194 (52.2)

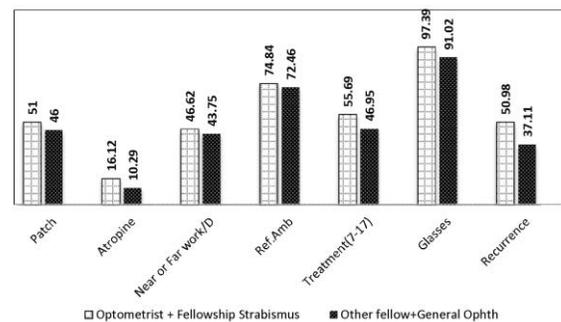
general ophthalmologists and other subspecialists (256 participants) whose education is not directly in line with amblyopia treatment were considered as group 2.

**Statistical analysis:** In order to describe the data, the frequency, percentage, range, mean, standard deviation and median were calculated. 95% confidence interval was also calculated to evaluate the accuracy of estimations. The statistical examinations of Kruskal Wallis and Mann-Whitney were applied as well. All statistical analyses were performed using SPSS version 20.0 (IBM/SPSS Inc., Chicago, IL, USA).

## Results

Overall, 409 practitioners participated in the current study (response rate was 68.1%) including 24 pediatric ophthalmologists and 129 optometrists, and 256 were general ophthalmologists and other subspecialists. Twenty questions were classified into seven groups, including:

1. The duration and type of patching in various intensities of amblyopia.
2. How to prescribe Atropine and possibility of its replacement by patching
3. Addition of one hour daily far or near work
4. How treat older children (7-17 year-old)
5. Vision improvement by prescription of glasses only
6. First choice of treatment in refractive amblyopia
7. Amblyopia recurrence rate



**Figure 1.** Mean Scores of Amblyopia Treatment Knowledge of Participants; D: Day, Ref: Refractive, Amb: Amblyopia, Yr: Year.

**Table 2:** Mean Scores of Participants in Relation to Different Amblyopia Treatments questions.

	Total	Optometrist + Fellowship Strabismus	Other fellow + General Ophthalmologist	p value*
Patch	48±18	51±16	46±19	0.005
Atropine	12.47±19.37	16.12±20.63	10.29±18.27	0.003
Near or Far work/D	44.82±22.04	46.62±18.86	43.75±23.71	0.202
Ref. Amb	73.35±27.76	74.84±25.73	72.46±28.93	0.403
Treatment (7-17)	50.22±20.87	55.69±20.12	46.95±20.66	<0.001
Glasses	93.4±24.86	97.39±16.01	91.02±28.65	0.012
Recurrence	42.3±49.46	50.98±50.15	37.11±48.4	0.006

D: Day, Ref: Refractive, Amb: Amblyopia

\* All p values are by Mann-Whitney Test

**Table 3:** Mean Scores of Amblyopia Treatment Knowledge of Participants in Relation to Epidemiologic Characteristics.

	Age Categories		Sex		Province of Practice		Practice Status		Duration of Practice		Number of referral Amb weekly	
	<=40	>40	Male	Female	Capital	Non Capital	Faculty	Non-Faculty	<=10	>10	<=3	>3
Patch	51 ± 15	44 ± 19	17 ± 46	19 ± 45	17 ± 48	18 ± 50	16 ± 45	19 ± 48	50 ± 16	45 ± 19	48 ± 18	47 ± 18
Atropine	13.2 ± 19.4	11.2 ± 19.1	19.4 ± 10.6	18.8 ± 10.5	19.3 ± 13.2	19.5 ± 12	18.6 ± 13.2	19.9 ± 12.8	12 ± 18.6	13.2 ± 19.9	12.8 ± 19.9	12.3 ± 18.7
Near or Far work	42.4 ± 20.3	46.8 ± 23	20.2 ± 43	23.1 ± 46.7	24.3 ± 44.1	20.9 ± 42.5	20 ± 48.3	22.5 ± 43.1	42.5 ± 20	48.3 ± 22.5	43.1 ± 20.83	46.6 ± 23
Ref Amb	72.5 ± 27	74.3 ± 27.3	25.6 ± 72.6	29.5 ± 73.6	27.9 ± 74.1	26.7 ± 75	25.6 ± 75.3	27.5 ± 72.6	75 ± 25.6	75.3 ± 27.5	72.6 ± 28.4	74.5 ± 27.5
Treatment (7-17)	52.8 ± 20.4	49.5 ± 21.2	20.4 ± 47.6	21 ± 50	19.2 ± 51	21.4 ± 51.5	20.7 ± 51	21.2 ± 50.3	51.5 ± 20.7	51 ± 21.2	50.3 ± 20.1	50.4 ± 21.7
Glass	97.3 ± 16.2	90.2 ± 29.9	21.1 ± 92.7	26.2 ± 94.3	23.4 ± 92.5	26.4 ± 94.4	23.1 ± 93.3	25.1 ± 94.1	94.4 ± 23.1	93.3 ± 25.1	94.1 ± 23.6	91.9 ± 27.3
Recurrence	45.5 ± 49.9	38.7 ± 48.9	50.1 ± 35.8	48.1 ± 40	49. ± 42.7	49.5 ± 44.4	49.8 ± 42.3	49.5 ± 41.6	44.4 ± 49.8	42.3 ± 49.5	41.6 ± 49.4	42.9 ± 49.6

Amb: Amblyopia, Yrs: Years, Ref: Refractive

Table 1 shows the demographic characteristics, practice status, provinces, years of practice and the number of their referral amblyopic children per week. They were mostly male (64%) and aged 25-40 year-old. Approximately half of the participants had a 10 year occupational record of working in Tehran and 20% had a practice status in a Medical university. Optometrists and pediatric fellows with an overall percentage of 37% were considered as the group 1 and others were regarded as the group 2. Table 2 and figure 1 imply the mean scores of participants' information about the rate and types of patching method in various amblyopia, Atropine prescription, and efficiency of additive far or near daily working, first choice for treatment of bilateral refractive amblyopia, key points of treatment in older

children (7-17 year-old), vision improvement rate by prescription of glasses only and amblyopia recurrence rate. As seen in this table, the mean scores of group 1 are more than the group 2, and except for the two groups of questions, one- additive far or near distance daily working (p value=0.202) and two-first choice for treatment of bilateral refractive amblyopia (p value=0.403), all had significant p values (all p value< 0.012). The worst and best scores referred to applying Atropine and prescription of glasses alone, respectively. The mean scores of other questions were about 50%. The information about mean scores of practitioners in accordance with their gender, province of practice, duration of practice and practice status are shown in table 3. In all parts, the female participants had better

**Table 4:** Spearman Correlation Coefficient and P-Values of Amblyopia Treatment Knowledge in Relation to their Epidemiologic Characteristics.

		Degree	Age	Sex	Province of Practice	Practice Status	Referral Amb weekly	Duration of Practice
<b>Patch</b>	Correlation Coefficient	---	-.191	---	---	---	-0.006	-.135
	p value	.002	.000	.073	.125	.062	.898	.009
<b>Atropine</b>	Correlation Coefficient	---	-0.064	---	---	---	-0.004	0.026
	p value	.002	.228	.281	.030	.200	.937	.617
<b>Near or Far work</b>	Correlation Coefficient	---	0.096	---	---	---	0.088	.136
	p value	.202	.068	.502	.077	.420	.071	.009
<b>Ref Amb</b>	Correlation Coefficient	---	0.036	---	---	---	0.031	0.015
	p value	.575	.497	.024	.851	.952	.532	.772
<b>Treatment (7-17)</b>	Correlation Coefficient	---	-0.096	---	---	---	-0.007	-0.013
	p value	.000	.070	.002	.003	.665	.883	.806
<b>Glasses</b>	Correlation Coefficient	---	-.149	---	---	---	-0.043	-0.022
	p value	.012	.005	.044	.262	.602	.377	.666
<b>Recurrence</b>	Correlation Coefficient	---	-0.068	---	---	---	0.013	-0.021
	p value	.006	.198	.185	.007	.686	.789	.682

Ref: Refractive, Amb: Amblyopia, p value: probability value

\* All p values are by Mann-Whitney Test

mean scores than males except for refractive amblyopia treatment. Also, practitioners from Tehran revealed better knowledge about treatment in older children and amblyopia recurrence than others but there was no difference regarding having a practice status.

Table 4 is based on Spearman correlation coefficient and p values of amblyopia treatment knowledge in relation to their epidemiologic characteristics. According to this table, younger practitioners have better answers to patching treatment and glasses prescription questions. Women had significantly higher scores about refractive amblyopia treatment, prescription of glasses and managing older children than their male colleagues. Practitioners from Tehran showed better scores in Atropine prescription, treatment of older children and recurrence rate with no relationship to their practice status or the number of referral amblyopia cases per week. Practitioners with less than 10 years of experience had better response to patching questions and those with more than 10 years of practice had better scores in questions related to additive far or near work daily. The average of Cronbach's  $\alpha$  of this questionnaire was 0.57 for both groups. The reason for the small

Cronbach's  $\alpha$  in this questionnaire relates to the different answers of the two groups to specific questions.

## Discussion

The purpose of this study was to recognize the amblyopia treatment knowledge of different groups of Iranian ophthalmologists and optometrists. The response rate of our study was 68.1%. Although it was not the optimal response rate, it was generally acceptable in comparison with other reports. In Khazaeni's study only 389 from 1200 mailed questionnaires were returned (33.1%), which is even less than ours<sup>22</sup>.

Seven scenarios according to recent publications of Pediatric Eye Disease Investigator Group trials were presented, each included patient with amblyopia and the practitioners were asked to choose from 6 treatment options. They were asked to indicate their preferred initial treatment in 1998 and in 2004 to determine whether there has been a change in treatment practice patterns of amblyopia between these 6 years or not. Results showed a change in practice patterns was observed for some of them<sup>21</sup>.

In Suttle et al. study, 400 questionnaires were sent to optometrists; only 179 were returned (44.75%), which is again less than ours. In their study rural or self-employed or full-time practice optometrists are less likely to refer the children elsewhere than those in cities<sup>22</sup>. The reason for their low response rates may be due to sending the questionnaires by mail, while in our study distribution and collection of questionnaires were done at approximately at the same time, which increased the response rate of the study.

As shown in table 2 and figure 1, mean scores of the group 1 were significantly higher than the group 2 in all 7 categories of questions and in 5 of them the differences were statistically significant as expected from their special educational courses.

The worst score was related to Atropine prescription and its replacement by patching in treatment of moderate amblyopia (12%) which can result in inappropriate or prescriptions being ignored. In ATS1, Repka et al. explained that patching and Atropine have the same effect on treatment of moderate amblyopia (V.A: 20/40 to 20/80)<sup>9</sup>; and in ATS4 it was implied that there was no difference between daily and weekend or twice a week prescriptions of Atropine<sup>10</sup>. Both methods improved vision about 2.3 lines after four months of therapy. Ignoring the fact that patching could be replaced by Atropine might have left poor cooperative or nystagmoid children untreated.

The best score was related to the effect of prescribing glasses only on vision improvement. Paying attention to this subject would prevent unnecessary patching of amblyopic child simultaneously with glass prescription. Scheiman et al. studied on 404 patients, 7 to 12 year-old children, 25% who had two lines of VA improvement after 6 months by only wearing their prescription. Additional patching, Atropine and near work resulted in the same consequence in 53% of them as well<sup>11</sup>.

The score of "first choice of treatment for refractive amblyopia" was also in an appropriate range (73%). It shows our practitioners had adequate knowledge about the prescription of glasses alone as a first choice and waiting for their vision to improve spontaneously. In ATS7, Wallace et al. employed prescribing glasses alone for 113 bilateral refractive

amblyopic 3-10 year-old children with a year of follow up and showed 3.4 to 3.6 lines of vision improvement<sup>12</sup>.

The mean scores of participants' information for other questions were about 50%. Patching method is known as the first and most effective way to treat amblyopia. Unfortunately, the related scores were found to be average, which is a warning about the inadequate information for the correct application of this method. Spiritual problems of amblyopic children and their family and stopping follow up visits due to prolonged patching of the dominant eye would be expected. According to Repka and Holmes study in ATS2, there is no difference between 12 hours and 6 hours of patching in deep amblyopia (VA<20/100), or 6 hours and 2 hours of patching in moderate amblyopia (VA 20/40 to 20/80). So the practitioners are recommended not to insist on long time unnecessary patching as was previously practiced<sup>13,14</sup>.

The participants had the mean scores of 45% for the question of additional one hour daily far or near work, which is not an acceptable score. Inadequate information about the effect of daily work would increase the duration of amblyopia treatment. Wallace in ATS5 showed about 1.1 line vision improvement by adding one hour of near work in a five week follow-up<sup>15</sup>. In ATS6, Holmes also explained that adding daily near work to the patching method can improve vision from 1.6 to 2.6 lines after one month follow up<sup>16</sup>.

The mean scores for treatment of older children were about 50%, which means that some of our practitioners do not believe in treating older children (7 to 17). By ignoring the treatment of older children, they would be deprived of trying to improve their vision. In ATS3 Scheiman studied on 404 patients between the ages of 7-12 and 103 patients between the ages 13-17 year-olds and employed a combination method of patching, Atropine, glasses and additional near work<sup>11</sup>. After six months of follow up, at least two lines of vision improvement was reported in 53% of children.

The information about the prevalence of amblyopia recurrence rate was also inadequate (42%). Lack of participants awareness of amblyopia recurrence would lead to abruptly stopping the treatment after achieving 20/20 visual acuity and not performing follow up on

the child occasionally, resulting in a high rate of recurrences. Holmes mentioned in ATS2c, 25% of their amblyopic children had recurrence in the one year follow-up after ceasing the treatment. He described how the sooner the treatment was stopped; the greater the possibility of recurrence would be expected<sup>17</sup>.

Lack of attitude and practice evaluation, low response rate, closed answer questions were the limitations of our study.

## Conclusion

Finally, considering the scores of participants suggests that Iranian practitioner knowledge about new methods of amblyopia treatment did not adequately correspond with all ATS' results even in group 1 who were directly responsible for treating these children. We suggest paying more attention to new modified methods of amblyopia treatment and more discussion of them in our annual and CME meetings.

## References

- Negrel AD, Maul E, Pokharel GP, Zhao J, Ellwein LB. Refractive Error Study in Children: sampling and measurement methods for a multi-country survey. *Am J Ophthalmol.* 2000;129(4):421-6.
- Arnold RW. Amblyopia and strabismus prevalence. *Ophthalmology.* 2009;116(2):365-6.
- Multi-ethnic Pediatric Eye Disease Study Group. Prevalence of amblyopia and strabismus in African American and Hispanic children ages 6 to 72 months the multi-ethnic pediatric eye disease study. *Ophthalmology.* 2008;115(7):1229-36.
- Fotouhi A, Hashemi H, Khabazkhoob M, Mohammad K. The prevalence of refractive errors among schoolchildren in Dezful, Iran. *Br J Ophthalmol.* 2007;91(3):287-92.
- Holmes JM, Clarke MP. Amblyopia. *Lancet.* 2006;22;367(9519):1343-51.
- Pai A, Mitchell P. Prevalence of amblyopia and strabismus. *Ophthalmology.* 2010;117(10):2043-4.
- Friedman DS1, Repka MX, Katz J, Giordano L, Ibranke J, Hawse P, Tielsch JM. Prevalence of amblyopia and strabismus in white and African American children aged 6 through 71 months the Baltimore Pediatric Eye Disease Study. *Ophthalmology.* 2009;116(11):2128-34.
- Yekta A1, Fotouhi A, Hashemi H, Dehghani C, Ostadimoghaddam H, Heravian J, et al. The prevalence of anisometropia, amblyopia and strabismus in schoolchildren of Shiraz, Iran. *Strabismus.* 2010;18(3):104-10.
- Pediatric Eye Disease Investigator Group. A randomized trial of atropine vs. patching for treatment of moderate amblyopia in children. *Arch Ophthalmol.* 2002;120(3):268-78.
- Repka MX1, Cotter SA, Beck RW, Kraker RT, Birch EE, Everett DF, et al. A randomized trial of atropine regimens for treatment of moderate amblyopia in children. *Ophthalmology.* 2004;111(11):2076-85.
- Scheiman MM1, Hertle RW, Beck RW, Edwards AR, Birch E, Cotter SA, et al. Randomized trial of treatment of amblyopia in children aged 7 to 17 years. *Arch Ophthalmol.* 2005;123(4):437-47.
- Wallace DK1, Chandler DL, Beck RW, Arnold RW, Bacal DA, Birch EE, Felius J, et al. Treatment of bilateral refractive amblyopia in children three to less than 10 years of age. *Am J Ophthalmol.* 2007;144(4):487-96.
- Holmes JM, Kraker RT, Beck RW, Birch EE, Cotter SA, Everett DF, et al. A randomized trial of prescribed patching regimens for treatment of severe amblyopia in children. *Ophthalmology.* 2003;110(11):2075-87.
- Repka MX1, Beck RW, Holmes JM, Birch EE, Chandler DL, Cotter SA, et al. A randomized trial of patching regimens for treatment of moderate amblyopia in children. *Arch Ophthalmol.* 2003;121(5):603-11.
- Wallace DK1, Edwards AR, Cotter SA, Beck RW, Arnold RW, Astle WF, et al. A randomized trial to evaluate 2 hours of daily patching for strabismic and anisometropic amblyopia in children. *Ophthalmology.* 2006;113(6):904-12.
- Holmes JM1, Edwards AR, Beck RW, Arnold RW, Johnson DA, Klimek DL, et al. A randomized pilot study of near activities versus non-near activities during patching therapy for amblyopia. *J AAPOS.* 2005;9(2):129-36.
- Holmes JM1, Beck RW, Kraker RT, Astle WF, Birch EE, Cole SR, Cotter SA, et al. Risk of amblyopia recurrence after cessation of treatment. *J AAPOS.* 2004;8(5):420-8.
- Pediatric Eye Disease Investigator Group. Pharmacological plus optical penalization treatment for amblyopia: results of a randomized trial. *Arch Ophthalmol.* 2009;127(1):22-30.
- Scheiman MM1, Hertle RW, Kraker RT, Beck RW, Birch EE, Felius J, Holmes JM, et al. Patching vs atropine to treat amblyopia in children aged 7 to 12 years: a randomized trial. *Arch Ophthalmol.* 2008;126(12):1634-42.
- Rutstein RP, Quinn GE, Lazar EL, Beck RW, Bonsall DJ, Cotter SA, et al. A randomized trial comparing Bangerter filters and patching for the treatment of moderate amblyopia in children. *Ophthalmology.* 2010;117(5):998-1004.
- Suttle CM, Wong R, Anderton PJ, Kim HJ, Kim JD, Lee MY. A survey of pediatric visual assessment by optometrists in New South Wales. *Clin Exp Optom.* 2003;86(1):19-33.
- Khazaeni L1, Quinn GE, Davidson SL, Forbes BJ. Amblyopia treatment: 1998 versus 2004. *J Pediatr Ophthalmol Strabismus.* 2009;46(1):19-22.