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A longitudinal study on the efficacy of vision therapy in the treatment of strabismus

Abstract

The original research design involved a recall of 100 successfully treated strabismus patients released from vision therapy one to five years ago. An objective examination was to be performed to determine binocular status, and an analytical exam to determine refractive status, phoric posture, fusional ranges and accommodative ranges. A questionnaire was to be completed by each subject to evaluate subjective changes in the areas of binocularity, diplopia, suppression, and cosmetic alignment. The results were to be evaluated by the Flam Criteria as modified by Ludlam. The percent of the patient population which had retained binocularity by these standards was to be determined. After considerable project modifications, the research data was limited to subjective findings. Seven out of the seven patients surveyed reported (1) satisfaction with the way their eyes were working, (2) they were using both eyes, and (3) considered their eyes properly aligned. Only one patient of seven reported either eye ever turning off. Five out of the seven responding reported that neither eye wandered at any time. These results are comparable to the results of the only previous longitudinal optometric study that has been conducted. According to our data, vision therapy for strabismus does have long-lasting results. Such results should provide impetus to the vision care specialist to provide treatment in the form of vision therapy to their strabismus patients.

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A LONGITUDINAL STUDY ON THE EFFICACY
OF VISION THERAPY IN THE TREATMENT
OF STRABISMUS

Submitted to Pacific University College of Optometry
in partial fulfillment of the requirements for
the Doctor of Optometry Degree

by

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Advisors

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March 31, 1983

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ABSTRACT

The original research design involved a recall of 100 successfully treated strabismus patients released from vision therapy one to five years ago. An objective examination was to be performed to determine binocular status, and an analytical exam to determine refractive status, phoric posture, fusional ranges and accommodative ranges. A questionnaire was to be completed by each subject to evaluate subjective changes in the areas of binocularity, diplopia, suppression, and cosmetic alignment. The results were to be evaluated by the Flom Criteria as modified by Ludlam. The percent of the patient population which had retained binocularity by these standards was to be determined.

After considerable project modifications, the research data was limited to subjective findings. Seven out of the seven patients surveyed reported (1) satisfaction with the way their eyes were working, (2) they were using both eyes, and (3) considered their eyes properly aligned. Only one patient of seven reported either eye ever turning off. Five out of the seven responding reported that neither eye wandered at any time. These results are comparable to the results of the only previous longitudinal optometric study that has been conducted.

According to our data, vision therapy for strabismus does have long-lasting results. Such results should provide impetus to the vision care specialist to provide treatment in the form of vision therapy to their strabismus patients.

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Final Grade

INTRODUCTION

Strabismus is believed to have been in existence since Biblical times. Today, this ocular abnormality is known to affect approximately 4 to 6 percent of the general population. Over the past century, several forms of treatment have evolved in an attempt to correct this problem. Proponents of each form of treatment have claimed various degrees of success. Unfortunately, many of these claims have not been substantiated by investigative studies to determine the long term effectiveness of those treatments. Such studies would be beneficial to eye care practitioners in planning the treatment regimen for their patients. This study first reviews some considerations in the need for the treatment of strabismus. Second, a review is made of previous studies on the effectiveness of optometric vision therapy and ophthalmological orthoptics. Third, the results of a longitudinal study on the efficacy of vision therapy in the treatment of strabismus is presented.

CONSIDERATIONS IN THE NEED FOR TREATMENT

Definition

Strabismus, which is used synonymously with squint, tropia, ophthalmotropia, heterotropia, manifest ocular deviation, cross eyes, and wall eyes, has been described as the condition in which binocular fixation is not present under normal seeing conditions. In normal binocular fixation both eyes are used simultaneously in such a manner that each retinal image contributes to the final

percept.¹ In strabismus, however, the two eyes are directed at different points when looking at an object in space. While one of the eyes takes up normal fixation of the object of regard, the other eye is directed to some other point in the field of view. Von Noorden² reports that in the absence of a properly functioning fusion mechanism, a more or less obvious deviation of one of the visual axes will be present. He terms this deviation a heterotropia, that is, a manifest deviation which is not kept in check by fusion. Morgan³ states the condition of strabismus involves at least two factors, sensory and motor. The sensory component involves a change in the input of visual information through the two eyes of the visual system. The motor component involves some kind of malalignment of the two visual axes with respect to an object of regard. Morgan's sensory and motor factors were further explained by Flax and Duckman.⁴ The misalignment of the two eyes, which is the obvious of the two factors, can lead to effects on personality development and interpersonal relationships. The disruption of the sensory processes of vision resulting from strabismus alters one's ability to make distance, size and directional judgements which are dependent upon sensory integration data from both eyes. This disruption of sensory integration can lead to interference and error in visual judgement, confusion, diplopia and/or suppression.

Lipton⁵ writes that "strabismus may affect the individual as a unique form of trauma because of certain pathophysiological effects. These may be complicated by the reactions of the individual's environment to the nature of the defect. Of crucial importance is the child's distrust of his own perceptions and the

resulting mental confusion. These factors interact with and influence the unfolding of the libidinal drives and aggression, the choice of defense mechanisms, and certain aspects of ego and superego development and functioning." Although this psychological trauma may influence the personality in long term ways, Lipton feels that strabismus as a direct result of psychological trauma is very rare.

Psychological Aspects

Groffman⁶ has presented a noteworthy literature review on the psychological aspects of strabismus and amblyopia. The premise for these effects are based on the contention that psychosomatic processes in conversion reactions are considered capable of manifesting in visual disturbances. He asks then, why is the reverse not possible--that visual disorders may cause psychological maladjustment. The following authors were cited in his review.

Beckwitt states that strabismus should be considered as a developmental maladaptive psychophysiological distortion, part hereditary and part environmental, like other psychosomatic conditions that originate in infancy. Rappaport, a psychiatrist, believes that patients with unresolved anger demonstrate convergent strabismus, while external strabismus is found in patients with an attitude of resignation and apathy. The convergent squint occurs from a tightening of the ego defenses whereas the divergent squint is giving up his defenses in a reality situation that appears hopeless. Hart puts forth the theory that any threat of visual disability evokes not only the anxiety one would expect concerning the direct loss of vision, but also many old anxieties about loss of other parts of the body. The degree and type of reaction then varies

depending on the personality structure and past experiences.

Heaton contends that the face and above all, the eyes are most important in revealing one's personality. An abnormal visual presentation then creates abnormal communications. The observer does not know which eye to attend to, leaving both the speaker and observer disturbed with the interaction. Fletcher and Silverman studied 1110 consecutive cases of strabismus and found certain characteristics more prevalent. In the six month to five year old group, the children were often hyperactive and irritable, late in walking, inclined toward accidents, prone to stumbling, and displayed gripes, tantrums, closing one eye, photophobia and blinking. Those strabismic children aged five to ten displayed problems with reading, writing, spelling, undue fatigue, headaches, emotional immaturity, short attention span, and hyperactivity.

Perceptually, strabismics often display one or more of the well known adaptations of suppression, amblyopia or anomalous correspondence. These adaptations are discussed in depth by Ludlam in Chapter 29 of Borish's Clinical Refraction.⁷

Epidemiology

The prevalence rate for strabismus will vary, depending upon the investigator's criteria and the location of the study. The following population studies reflect these variances. Frandson's study⁴ (1960) of the six year old population in Copenhagen revealed a 6 percent prevalence of strabismus. Graham's study⁸ (1974) of the Cardiff population indicated a 5.66 percent prevalence.

The National Center for Health Statistics of the U.S. Department of H.E.W. in its published report in 1975⁹ revealed a prevalence of 6.72 percent overall in the 12 to 17 year old population

of its study of 6768 youth. Not surprisingly, regional differences in rate were established. (See Appendix A.) Strabismus in the 12 to 17 year old population was nearly twice as frequent in the mid-west as in the other regions. The north-east region, however, showed a higher incidence of strabismus in the 6 to 11 year old age population.

The difference in incidence between white and Negro, and male and female populations were also apparent from the data. Negro males showed a higher incidence in the 12 to 17 age but only a slight increase in the 6 to 11 age as compared to the white male population. Negro girls in both age groups displayed a lower incidence of strabismus.

The U.S. Statistical data indicated that as age increases over the range of 6 to 17 years, there is a gradual increase in the prevalence of strabismus, being more consistent among the males than the females. The rate is variable, however, and a decreased rate is recorded for the 9 to 11 year olds. The reader is cautioned here that no consistent trends related to age or sex were identified.

Manifest strabismus is reported as the most prevalent eye abnormality. We assume this excludes refractive error. Among the youths, the incidence of left tropia approximately equaled that of right tropia. Eighty percent of the discovered tropias were unilateral, the other 20 percent being either bilateral or alternating.

REVIEW OF THE LITERATURE

Several researchers have compiled data on the success rates of their orthoptic treatment of strabismus cases. The results of these studies are difficult to compare for several reasons. First,

it is important to clearly outline the criteria that are being used to determine success or failure of each particular case. Unfortunately, there are nearly as many sets of criteria as there are researchers. Each clinician chooses certain criteria that he feels will adequately and whenever possible objectively evaluate a patient's binocular and cosmetic status. Second, the population under consideration varies between studies. Some investigators examine one category of strabismus, for instance divergence excess, while others examine several cases of all categories. A third complication is that some results published are those immediately following treatment and others are from examinations given months or years after the treatment was completed, making direct data comparisons invalid.

One set of criteria that has been used by several investigators is that established by Flom in 1958 at the University of California Optometry School.¹⁰ The criteria for a "functional cure" of strabismus, as adopted at the beginning of the U.C. study were as follows: clear, comfortable, single binocular vision must be present at all distances up to the near point of convergence, which is normal itself; there must be stereopsis and normal ranges of motor fusion; an occasional turning of the eyes may occur (up to 1 percent of the time) providing diplopia is experienced whenever this happens; correction lenses and small amounts of prism (up to 5^Δ) may be worn if necessary.

A second set of criteria was adopted for the category of "almost cured". In this category a patient may lack stereopsis, may exhibit strabismus with diplopia up to 5 percent of the time, and may need larger amounts of prism to maintain comfortable

binocular vision. In all other respects the patient must meet the criteria for "functional cure".

Categories of "moderate improvement" and "slight improvement" were adopted for those patients for whom the main improvement was, respectively, in more than one, or in only one, of the defects associated with the strabismus. The category of "no improvement" was adopted for those patients for whom there was no significant improvement in the strabismus or its associated defects.

Ludlam¹¹ (1961) conducted a study involving 149 concomitant strabismics who had orthoptic treatment at the Optometric Center of New York. The requirements to be included in this study were: a strabismus--either constant, intermittent or periodic--which could not be corrected with lenses; no previous surgery, no evidence of a muscle paresis or paralysis, and attendance of at least eight treatment sessions.

The criteria for binocular function were those set by Flom with the additional stipulation that there be satisfactory binocular motility in all directions of gaze to achieve functional cure. The patients were treated in group therapy session led by different clinicians on different days. At the end of the training, 33 percent had achieved the functional cure status, and 40 percent were in the almost cured category. Overall, 113 of the 149 patients had binocular vision with straight eyes at least 95 percent of the time.

Eighty-one of these patients were reexamined three years later.¹² Of this group, 96 percent were successful by cosmetic cure criteria. By the Flom criteria, 62 percent were functional cures, 27 percent were almost cures and 11 percent were failures.

A total of 89 percent of the 81 patients recalled showed a long term retention of their binocularity and alignment.

Sanfilippo and Clahane¹³ (1968) examined 31 exotropic patients 4½ to 6½ years after completing their orthoptic training. The therapy was described as intensive home therapy in as brief a period of time as possible. Generally the weekly office visit was only to evaluate the patient's progress and teach the parent new training procedures. Most patients were seen for seven to eight visits with the range extending from five to twenty-two visits. The criteria for determining the binocular status was:

1. Excellent: Phoric at all distances and in the reading position; absolute convergence $\geq 20^{\Delta}$ distance and near; relative convergence $\geq 15^{\Delta}$, unlimited NPC, no suppression, excellent awareness of diplopia and no asthenopia.
2. Good: Phoria--same as excellent; absolute convergence $\geq 15^{\Delta}$; relative convergence $\geq 10^{\Delta}$, NPC ≤ 5 cm; slight central suppression; good awareness of diplopia; no asthenopia.
3. Fair: Intermittent tropia at one distance; absolute convergence $\geq 10^{\Delta}$; relative convergence $\geq 5^{\Delta}$, NPC ≤ 7 cm, moderate peripheral and foveal suppression; fair awareness of diplopia; slight asthenopia and problems with diplopia.
4. Poor: Tropia at any distance or intermittent at two distances; absolute convergence $< 10^{\Delta}$; relative convergence $< 5^{\Delta}$, NPC > 8 cm, deep peripheral and foveal suppression, no awareness of diplopia; asthenopia.

Their results show that the binocular status of 97 percent of the patients were improved or excellent immediately after the

training, and 84 percent of the patients were improved or excellent at the follow-up examination. The largest single group of patients (35 percent) were those whose rating was poor before therapy and excellent at both the immediate and long term follow-up examinations.

<u>patient's response to therapy</u>	<u>immediate results</u>	<u>long term results</u>
failure (no change)	3.2%	16.1%
improved (good or fair)	32.3%	32.3%
excellent	64.5%	51.7%

Another study which utilized the Flom Criteria as modified by Ludlam was conducted by Hoffman, Cohen, Feuer and Klayman¹⁴ (1970). Out of 55 cases of strabismus, an overall success ratio of 87.1 percent was achieved. The patients in this study were treated in a private practice. None had had surgery, muscle pareses or paralysis, or anomalous retinal correspondence.

A clinical study at the University of Indiana (1973) where the TBI was used as the primary training technique resulted in 44 percent functional cure rate.¹⁵ Allen's category of functional cure corresponds to Flom's "almost cured" category. In addition, 16 percent of the patients attained a cosmetic cure.

In a review of 42 patients treated in a private practice, Etting¹⁶ (1973) found 64 percent were functional cures by the Flom criteria. Prior to treatment, the patients displayed strabismus at far and near and agreed to attend at least 12 half hour vision training sessions.

Another paper by Etting¹⁷ reviewing 86 patients revealed an overall functional cure rate of 71 percent and a cosmetic cure rate of 19 percent. A cosmetic cure was defined as a deviation of

less than 15^A. If the patient entered therapy meeting this criterion, then he had to meet an additional requirement that he demonstrated first, second, and third degree fusion at all points in space even though one eye might be slightly turned with ARC at the conclusion of the therapy.

Flax and Duckman⁴ (1978) have compiled the results from a number of studies utilizing both ophthalmological orthoptics and optometric vision therapy. The criteria they used for success in these studies are also included. Their summary of the results of these papers can be found in Appendix B.

A more recent study by Goldrich¹⁸ (1980) could also be added to these tables. Goldrich reviewed all cases of divergence excess strabismus discharged from vision training at the State University of New York in 1975 and 1976. Their training consisted of 45 minute weekly sessions with a therapist combined with home training assignments. Each therapist worked with one to three patients simultaneously, depending on the patient's needs. The criteria for evaluation of these cases were set as follows:

- A. Excellent: 1. Phoric distance and near as determined by the cover test. 2. No asthenopia. 3. Satisfactory binocular skills: (a) within normal limits on Keystone far tests of simultaneous vision, vertical and lateral posture, fusion, stereopsis, near point tests of posture and fusion; (b) BI and BO fusional ranges at 16 inches and 20 feet at or greater than Morgan's minimum expected; (c) appreciation of stereopsis at near, intermediate ranges and distance with vectograms and Basic Stereo Motivator anaglyphs; (d) accommodative facility--able to

clear fine letter targets at 16 inches within three seconds with plus and minus 3.00 D. spheres on an accommodative rock while maintaining fusion monocularly and binocularly.

- B. Good: 1. Phoria--same as excellent. 2. No asthenopia.
3. Binocular skills: (a) Keystone skills same as excellent but deficient in one area; (b)-(d) same as excellent.
- C. Fair: 1. Intermittent tropia at distance. 2. No asthenopia. 3. Binocular skills: (a) Keystone skills deficient in more than one area; (b) fusional ranges over pre-VT findings, but may be less than Morgan's expected; (c) appreciation of stereopsis at distances greater than pre-VT findings; (d) satisfactory accommodative facility.
- D. Poor: Little improvement shown.

Goldrich found the following:

<u># patients</u>	<u>%</u>	<u>rating</u>	<u>mean # therapy sessions</u>
20	71.4	excellent	20.2
3	10.7	good	28.3
4	14.3	fair	39.8
1	3.5	poor	35.0

Just as there has been a variety of clinical studies, the results of these studies have likewise varied. The literature has vacillated on its stand on the effectiveness of vision therapy in treating strabismus. Optometric researchers do concur, however, on the following aspects in the treatment of strabismus. Exotropia is considered to be more successfully trained than esotropia. Hoffman¹⁴ reported 100 percent success with exotropes in his study versus 76 percent success with esotropes. Ludlam¹¹ (1961) reports that exotropes required fewer training visits to reach a functional or cosmetic

cure and that a greater percent of exotropes (82 percent) versus esotropes (64 percent) finished his study as cured. Both authors agree that intermittent or periodic tropia is more successfully treated than unilateral tropia. This has periodically been contra-indicated in the literature. The quality of results obtained in training are found to be inversely related to the size of the angle, with the best results obtained in tropias of less than 30^Δ deviation.

The presence of anomalous correspondence as indicated by the Hering-Bielschowsky After-Image technique is a valuable indicator of the success of treatment. Ludlam¹¹ found a 4 to 1 ratio against curing strabismus if anomalous retinal correspondence is present in three or more tests.

Although young children have been found to respond most favorably to vision therapy, the age of the patient in itself does not preclude successful treatment. Motivational factors also contribute to the variance in success rates.

Layland¹⁹ (1971) listed those squints most unlikely to respond to treatment:

1. Squint of pathological origin--e.g. resulting from vascular insufficiency or hemorrhage.
2. Cyclotropia, hypertropia, or squint of large horizontal angles ($> 20^\circ$ convergence or $> 25^\circ$ divergence).
3. Patients that are cosmetically satisfied with their appearance.
4. Squints with marked nonconcomitance.
5. Squints of long standing duration and relatively good cosmetic appearance.

Ophthalmological literature often presents a different projection of the success of non-surgical treatment of strabismus.

Although ophthalmological orthoptics is a long recognized adjunct in the surgical treatment of strabismus, ophthalmological studies reveal a lower percent success rate than those in optometry. Flax contributes this higher success rate of optometric vision therapy to three factors: (1) More active office treatment visits; (2) A broader approach to orthoptics, utilizing more treatment modalities, techniques, and strategies; (3) The study of orthoptics has a greater influence and plays a larger part in the education of optometrists.

CONSIDERATIONS IN RESEARCH DESIGN

So far we have attempted to elucidate the potential psychological and perceptual problems associated with strabismus, as well as delineate the variety of studies undertaken in an attempt to determine the effectiveness of vision therapy and/or orthoptics in treating strabismus. Many authors do not outline the factors upon which they base their analysis of the populations studied. Numerous variables influence the outcome of the treatment of strabismus and are therefore worthy of consideration in the design of any study. The following factors are considered by the authors to be pertinent to the research design:

A. Factors in the case history:

1. Family history of strabismus
2. Age of onset
3. Time between onset and beginning of therapy
4. Previous surgery and/or therapy

5. Sex

B. Factors involving the deviation itself:

1. Magnitude: variable or constant, linked with accommodation
2. Direction: eso, exo, hyper, hypo, cyclo
3. Frequency: constant, intermittent, periodic
4. Concomitancy or nonconcomitancy
5. Correspondence: normal or abnormal
6. Fixation: normal or eccentric
7. Near binocular fixation range
8. Amblyopia
9. Suppression

C. Factors affecting visual performance:

1. Visual acuity
2. Refractive error
3. Accommodative amplitude and facility
4. Fusional ranges
5. Motor skills: gross, fine, oculomotor-pursuits, saccades, rotations
6. Stereopsis: central and peripheral

D. Factors involving the therapy:

1. Conscientiousness with home training
2. Patient's regular attendance
3. Number of therapy sessions
4. Frequency of therapy sessions
5. Intensity of therapy
6. Type of therapy
7. Goals of therapy: cosmetic or functional

8. Skill of the therapist
9. Number of patients per therapist simultaneously
10. Transfer of patients from one therapist to another
(continuity)
11. Interpretation of patient responses

ORIGINAL HYPOTHESIS

The authors hypothesize that of those strabismus patients released from therapy after successfully achieving either a cosmetic cure, functional cure or almost cure as measured by the Flom criteria and modified by Ludlam, the level of binocularity upon exiting from therapy will be maintained in 85 percent of the patients when measured three to five years post vision therapy.

EXPERIMENTAL DESIGN

A recall was to be made on a group of 100 successfully treated strabismus patients released from training three to five years ago. These patients were to be referred from the Pacific University Optometry Clinic and nine private practitioners in the Portland Metropolitan area who offer vision therapy in their practices. A visual examination was to be performed and would include:

1. Case history to review the onset of strabismus, subsequent vision therapy obtained and any further treatment since released, subjective awareness of the presence or absence of binocularity, diplopia or suppression, and an evaluation of the cosmetic effect of the vision therapy.
See Appendix C.
2. A non-cycloplegic analytic exam to determine: (a) refractive status, (b) phoric posture, (c) fusional ranges,

(d) accommodative ranges. See Appendix D.

3. An objective examination to determine the patient's binocular status. See Appendix E.

REVISIONS OF EXPERIMENTAL DESIGN

Over 400 patients were released from the vision therapy clinic at Pacific University during the time period from August 1977 to August 1979. Of these, records were sufficient for ten strabismics who met the criteria for our study. Four of these patients were located, and two participated in our research project. Of the nine Optometrists contacted in the Portland Metropolitan area, none were able to remember any patients specifically from that time period, nor did they have recall systems capable of culling the necessary information. Also, we found it was not feasible to remove patients from private practices for the purposes of this study. Therefore, in order to increase our patient population, the time period from which patients were to be obtained was extended to include those released from therapy between August 1979 and August 1981. In addition, the patient's involvement in the study was limited to the case history questionnaire.

The study hypothesis was then revised to state: Of those strabismus patients successfully released from vision therapy, the level of binocularity upon exiting from therapy will be retained in 85 percent of the patients as assessed by the subjective questionnaire.

Upon receiving no response from local practitioners, our study was expanded to include involvement of fourteen Optometrists from across the nation. These practitioners were also known to

provide vision therapy services for their strabismus patients.

RESULTS

A total of 23 practitioners were contacted in regards to this study. Four practitioners responded by sending us the names of patients who could be included in the study. A total of 19 names were submitted. Of those 19, 8 completed and returned our questionnaire. One of these patients was not included in the data collection due to the onset of strabismus associated with trauma, and subsequent medical problems. The results of the remaining seven questionnaires have been tabulated in Appendix F to correspond with the format of the questionnaire.

DISCUSSION

Subjective questionnaires were obtained from seven patients from four different practitioners and one Optometry College. The results have been tabulated in Appendix G. First, although the sample population is limited, it is heartening to find that 100 percent of the patients were satisfied with the way their eyes were working. From this standpoint then, vision therapy has met the patient's expectations. Second, two patients did continue to occasionally have one eye wander. All the patients felt they were using both of their eyes though. Subjectively then, vision therapy has helped to maintain their binocularity. This cannot be verified, however, without an objective evaluation of each patient's level of binocularity. Third, each patient also felt that their eyes were properly aligned. This is an important aspect since the cosmetic alignment is thought to affect one's mental and emotional development. And fourth, only one of the seven patients

continued to experience suppression. This patient reported suppressing less often than before vision therapy was instituted.

The length of time post vision therapy for these patients varied from one year to five years. It is obvious then, that for these seven patients the maintenance of their exiting level of binocularity as assessed by the subjective questionnaire was retained in 100 percent of the patients. This compares favorably with the only previous longitudinal study on the optometric treatment of strabismus, as conducted by Ludlam and Kleinman, whose results showed an 89 percent maintenance as measured by the Flom criteria. Such positive results would reflect well on the ability of the practitioners offering such therapy. It is hoped that these results, however limited in scope, will provide impetus to the vision care specialist to provide treatment in the form of vision therapy for their strabismus patients.

APPENDIX A

Table 12. Prevalence rates for tropia and for other extraocular muscle problems among youths age 12-17 years with at least "normal" and with defective uncorrected acuity at distance and near, by age and sex: United States, 1966-70

Age and sex	Tropia		Other eye muscle conditions		Tropia		Other eye muscle conditions	
	Distance acuity without glasses				Near acuity with own glasses			
	20/20 or better	20/40 or less	20/20 or better	20/40 or less	14/14 or better	14/35 or less	14/14 or better	14/35 or less
Prevalence rates per 100 youths								
<u>Both sexes</u>								
12-17 years-----	2.0	1.0	1.2	0.5	2.2	0.5	1.3	0.2
12 years-----	2.4	0.5	0.9	0.3	2.2	0.1	1.0	0.2
13 years-----	1.8	1.1	1.2	0.6	1.9	0.5	1.3	0.1
14 years-----	1.5	1.7	1.0	0.5	2.3	0.8	1.2	0.2
15 years-----	2.2	0.5	1.3	0.3	2.2	0.2	1.4	0.1
16 years-----	1.8	1.3	1.6	0.8	1.6	0.7	1.9	0.4
17 years-----	2.4	1.1	1.0	0.3	3.1	0.7	1.0	0.3
<u>Boys</u>								
12-17 years-----	2.3	1.1	1.3	0.5	2.5	0.6	1.4	0.3
12 years-----	2.6	0.3	1.1	0.5	2.3	0.2	1.2	0.3
13 years-----	2.2	0.9	1.2	0.4	2.4	0.4	1.4	0.1
14 years-----	1.3	1.8	1.2	0.6	2.4	0.5	1.6	0.3
15 years-----	2.1	0.8	1.4	0.3	2.2	0.2	1.4	-
16 years-----	2.8	1.3	1.1	0.7	2.6	0.7	1.3	0.7
17 years-----	2.9	1.8	1.3	0.4	3.4	1.3	1.1	0.3
<u>Girls</u>								
12-17 years-----	1.7	0.9	1.1	0.4	1.9	0.4	1.2	0.1
12 years-----	2.2	0.7	0.7	0.1	2.1	-	0.7	0.1
13 years-----	1.4	1.3	1.0	0.7	1.5	0.5	1.0	-
14 years-----	1.6	1.5	0.7	0.4	2.2	1.0	0.8	0.2
15 years-----	2.3	0.2	1.2	0.3	2.3	0.2	1.4	0.1
16 years-----	0.8	1.3	2.2	0.8	0.7	0.6	2.6	0.2
17 years-----	1.8	0.4	0.7	0.2	2.7	-	0.9	0.2

Table 15. Prevalence rates for principal infectious and functional eye abnormalities observed on direct examination of white and Negro youths age 12-17 years, by general type of condition, age, and sex: United States, 1966-70; with selected rates for white and Negro children age 6-11 years: United States, 1963-65

Abnormality and race	Both sexes							Boys 12-17 years	Girls 12-17 years	12-17 years		
	12-17 years	12 years	13 years	14 years	15 years	16 years	17 years			Both sexes	Boys	Girls
	Rate per 1,000 youths								Standard errors			
Any eye abnormality:												
White-----	75.8	73.5	77.0	77.4	56.6	83.8	87.8	84.9	66.5	6.0	6.7	7.9
Negro-----	103.9	136.4	80.5	65.3	125.9	109.2	108.1	122.8	85.4	16.1	28.0	16.7
Lids, sclerae, conjunctivae:												
White-----	19.3	21.2	15.9	22.8	10.9	23.3	21.7	25.6	12.7	1.8	3.5	1.7
Negro-----	36.0	54.6	48.6	9.3	36.5	29.0	35.7	36.0	35.9	9.5	13.8	9.2
Pupils, irides:												
White-----	9.1	10.5	10.4	9.3	6.4	8.3	9.7	10.9	7.3	2.6	3.5	2.0
Negro-----	13.0	10.5	-	11.7	18.7	-	40.2	13.3	12.7	5.7	8.4	7.3
Tropia (manifest strabismus):												
White-----	35.0	31.6	38.8	35.9	25.3	31.0	48.0	37.2	32.7	4.5	5.5	5.5
Negro-----	32.5	31.2	11.3	34.9	49.0	46.5	24.5	50.7	14.7	12.9	23.0	4.7
All other extraocular muscle conditions:												
White-----	16.5	12.7	17.7	15.3	13.0	24.6	16.0	17.1	15.8	3.2	4.1	3.3
Negro-----	28.2	32.9	16.8	21.1	41.3	41.5	16.6	32.9	23.5	9.2	10.0	10.7
Latent strabismus:												
White-----	3.9	2.8	4.6	4.0	1.0	5.4	6.0	5.0	2.8	1.5	1.9	1.5
Negro-----	9.7	12.2	6.0	5.9	13.2	15.9	5.3	13.4	6.1	3.8	4.6	3.6
	Both sexes							Boys 6-11 years	Girls 6-11 years	6-11 years		
Abnormality and race	6-11 years	6 years	7 years	8 years	9 years	10 years	11 years			Both sexes	Boys	Girls
	Rate per 1,000 children								Standard errors			
Any eye abnormality:												
White-----	129.0	109.3	111.6	144.8	127.3	140.4	142.4	115.5	143.0	29.9	27.4	32.9
Negro-----	90.2	58.4	89.7	101.1	123.3	91.3	78.3	95.9	84.4	8.4	12.4	13.7
Tropia (manifest strabismus):												
White-----	24.3	19.3	25.8	32.9	21.6	20.2	26.2	23.6	25.1	2.8	2.9	3.7
Negro-----	21.3	16.2	11.1	21.2	26.9	21.5	32.4	27.5	15.0	3.7	7.5	5.9
Latent strabismus(confirmed):												
White-----	45.7	41.8	35.2	53.0	45.8	49.5	49.4	37.2	54.5	9.7	9.3	10.8
Negro-----	28.5	-	32.2	60.5	31.4	22.7	24.1	29.0	28.0	5.5	8.9	7.0

Table 16. Prevalence rates for principal infectious and functional eye abnormalities observed on direct examination of youths age 12-17 years, by general type of condition, age, sex, and geographic region: United States, 1966-70; with selected rates for children age 6-11 years by geographic region: United States, 1963-65—Con.

Abnormality and geographic region	Both sexes							Boys 6-11 years	Girls 6-11 years	6-11 years		
	6-11 years	6 years	7 years	8 years	9 years	10 years	11 years			Both sexes	Boys	Girls
	Rate per 1,000 children									Standard errors		
Any eye abnormality:												
Northeast-----	123.6	93.8	103.8	166.6	116.5	125.1	137.6	118.7	128.5	18.8	19.3	22.2
Midwest-----	114.5	85.2	99.0	120.8	121.6	137.2	121.4	102.1	127.3	10.4	12.0	13.5
South-----	83.6	60.9	77.3	80.1	77.2	100.2	107.6	66.5	100.7	9.8	8.0	15.3
West-----	172.5	162.7	155.2	179.7	199.4	166.3	173.8	160.7	185.5	117.7	103.9	132.8
Tropia (manifest strabismus):												
Northeast-----	30.1	24.5	31.0	38.2	24.8	18.3	43.2	27.4	32.8	5.1	6.9	6.8
Midwest-----	22.9	18.2	21.6	19.0	26.5	33.7	17.8	22.9	23.0	2.9	2.9	4.0
South-----	22.3	17.4	21.9	31.9	19.2	12.9	31.6	20.4	24.2	4.1	3.3	5.5
West-----	20.5	15.5	20.9	36.9	17.0	13.1	18.6	25.7	14.7	5.9	6.9	6.5
Latent strabismus (confirmed):												
Northeast-----	56.1	37.8	32.9	89.3	46.6	69.1	63.8	51.2	61.1	14.8	15.4	17.6
Midwest-----	43.4	26.6	44.2	47.5	44.0	50.6	46.1	32.2	55.0	4.9	7.6	5.7
South-----	21.7	9.4	15.6	25.7	15.7	32.0	33.5	15.5	27.9	6.7	6.6	9.1
West-----	52.8	67.3	44.0	51.9	76.5	34.5	42.2	45.9	60.4	35.9	30.9	41.5

Table 16. Prevalence rates for principal infectious and functional eye abnormalities observed on direct examination of youths age 12-17 years, by general type of condition, age, sex, and geographic region: United States, 1966-70; with selected rates for children age 6-11 years by geographic region: United States, 1963-65

Abnormality and geographic region	Both sexes							Boys 12-17 years	Girls 12-17 years	12-17 years		
	12-17 years	12 years	13 years	14 years	15 years	16 years	17 years			Both sexes	Boys	Girls
	Rate per 1,000 youths									Standard errors		
Any eye abnormality:												
Northeast-----	69.5	56.4	64.9	80.4	57.2	71.6	89.6	82.1	56.6	9.6	17.8	10.3
Midwest-----	86.6	95.2	100.1	79.3	73.8	80.3	88.8	93.5	79.7	11.6	13.0	12.3
South-----	81.2	88.5	74.7	84.7	53.3	99.0	89.6	92.4	69.6	14.5	18.9	12.8
West-----	77.4	84.4	63.4	58.1	72.5	94.9	92.0	88.2	66.4	19.6	16.6	24.8
Lids, sclerae, conjunctivae:												
Northeast-----	29.1	32.6	25.3	27.7	28.8	23.1	37.6	41.0	17.0	11.3	17.8	5.7
Midwest-----	13.6	14.7	17.0	14.3	7.9	12.4	15.2	16.6	10.7	1.7	3.5	2.4
South-----	28.0	37.1	26.9	25.6	13.8	32.4	33.7	33.9	21.8	3.7	6.7	1.7
West-----	17.2	22.1	13.5	17.5	8.8	29.4	11.4	19.4	15.0	2.9	5.1	8.3
Pupils, irides:												
Northeast-----	6.8	2.4	-	15.6	4.1	-	20.1	7.7	5.8	3.2	4.8	4.0
Midwest-----	6.1	5.0	7.0	3.8	8.5	6.5	5.7	7.3	4.9	1.5	2.5	3.2
South-----	8.7	9.8	7.1	3.0	12.8	3.7	16.4	6.4	11.2	2.3	2.0	3.3
West-----	16.7	24.4	21.3	16.8	5.6	16.8	14.8	22.9	10.4	8.2	11.5	5.3
Tropia (manifest strabismus):												
Northeast-----	26.4	12.0	29.3	40.0	16.8	34.5	26.9	26.5	26.3	6.8	8.9	9.1
Midwest-----	50.6	57.4	53.9	44.2	47.0	35.8	65.0	55.6	45.7	13.1	14.0	13.6
South-----	28.8	22.5	31.7	37.4	9.7	36.3	36.4	36.3	21.0	6.9	11.0	6.8
West-----	28.6	27.4	20.2	20.5	34.6	25.7	44.3	33.0	24.0	7.2	10.8	6.9
All other extraocular muscle conditions:												
Northeast-----	9.3	6.8	6.6	19.2	4.1	13.9	4.6	6.8	11.8	2.6	3.5	3.4
Midwest-----	15.6	12.6	22.0	16.8	5.2	30.4	6.3	15.1	16.2	3.7	7.3	5.3
South-----	25.0	21.2	12.1	25.4	29.8	29.7	32.0	28.8	21.1	10.5	10.3	10.8
West-----	21.5	21.7	27.0	3.1	25.9	30.1	21.3	25.1	17.9	11.2	10.9	13.4
Latent strabismus:												
Northeast-----	1.1	-	-	-	-	3.0	4.6	-	2.3	1.0	-	2.1
Midwest-----	3.3	2.9	2.7	7.1	-	7.3	-	5.6	1.0	0.8	1.7	1.3
South-----	10.1	12.5	6.4	9.3	10.2	12.7	9.7	10.6	9.6	5.5	5.8	5.4
West-----	4.2	2.2	10.0	-	-	3.6	9.9	7.5	0.8	2.4	4.4	1.0

Table 18. Prevalence rates for principal infectious and functional eye abnormalities observed on direct examination of white youths age 12-17 years, by general type of condition, age, sex, and geographic region: United States, 1966-70

Abnormality and geographic region	Both sexes							Boys 12-17 years	Girls 12-17 years	12-17 years		
	12-17 years	12 years	13 years	14 years	15 years	16 years	17 years			Both sexes	Boys	Girls
	Rate per 1,000 white youths								Standard errors			
Any eye abnormality:												
Northeast-----	59.2	36.0	57.3	76.9	52.2	66.2	69.6	71.5	45.9	12.5	19.7	11.3
Midwest-----	84.3	91.2	94.2	78.3	72.2	78.2	89.6	93.2	75.3	13.3	14.4	13.5
South-----	75.9	59.6	72.3	95.0	34.0	97.2	100.1	85.3	66.0	11.8	14.6	13.0
West-----	71.7	81.7	67.7	60.0	45.3	93.4	82.3	81.3	62.0	19.8	16.4	24.0
Lids, sclerae, conjunctivae:												
Northeast-----	25.2	23.1	21.6	28.3	28.3	17.0	33.7	37.0	12.5	7.7	13.4	2.7
Midwest-----	14.0	16.1	15.7	15.6	5.8	13.7	16.5	17.2	10.7	1.4	3.8	2.2
South-----	25.5	27.2	11.2	31.8	6.6	44.3	33.2	34.2	16.4	3.5	6.1	2.5
West-----	15.6	21.3	14.4	19.1	6.0	23.2	9.0	18.9	12.3	2.8	5.2	6.2
Pupils, irides:												
Northeast-----	2.8	2.8	-	9.8	-	-	4.0	3.3	2.3	1.5	1.7	1.6
Midwest-----	5.6	2.2	7.6	4.2	9.5	7.2	3.0	7.0	4.2	0.7	2.9	2.5
South-----	9.7	13.6	10.3	4.1	9.1	5.0	16.8	7.6	12.0	2.2	1.8	3.7
West-----	17.8	24.3	22.7	18.3	6.1	18.1	16.5	24.2	11.3	8.9	12.4	5.7
Tropia (manifest strabismus):												
Northeast-----	28.8	14.0	34.3	41.7	19.1	33.2	31.1	26.7	31.0	7.2	9.2	10.1
Midwest-----	53.1	62.8	52.6	48.1	48.5	35.6	70.4	58.6	47.6	15.0	16.4	15.6
South-----	27.8	12.4	45.9	33.4	2.8	27.0	47.8	31.7	23.6	4.4	8.6	7.3
West-----	25.1	24.5	21.6	19.1	23.3	27.6	35.8	26.5	23.7	7.1	9.2	7.4
All other extraocular muscle conditions:												
Northeast-----	10.0	4.0	7.7	21.9	4.7	15.8	5.3	7.7	12.4	3.2	3.9	4.9
Midwest-----	11.1	8.0	18.1	10.3	2.8	23.0	3.6	9.2	12.9	4.2	7.6	3.8
South-----	23.7	15.3	12.7	30.4	19.5	25.2	38.7	26.8	20.4	10.2	9.9	10.9
West-----	22.5	23.9	28.8	3.4	25.3	32.4	20.8	26.5	18.5	12.1	11.6	14.6
Latent strabismus:												
Northeast-----	1.3	-	-	-	-	3.5	5.3	-	2.7	1.2	-	2.5
Midwest-----	1.2	-	-	7.8	-	-	-	2.5	-	1.3	2.6	-
South-----	10.6	12.0	9.3	8.3	4.7	17.4	12.8	9.8	11.4	5.4	5.2	5.9
West-----	4.1	2.4	10.7	-	-	3.9	8.0	8.2	-	2.4	5.0	-

Table 19. Prevalence rates for principal infectious and functional eye abnormalities observed on direct examination of Negro youths age 12-17 years, by general type of condition, age, sex, and geographic region: United States, 1966-70

Abnormality and geographic region	Both sexes							Boys 12-17 years	Girls 12-17 years	12-17 years		
	12-17 years	12 years	13 years	14 years	15 years	16 years	17 years			Both sexes	Boys	Girls
	Rate per 1,000 Negro youths								Standard errors			
Any eye abnormality:												
Northeast-----	100.6	116.6	47.0	81.3	69.0	115.3	186.5	132.3	76.6	46.7	64.8	41.8
Midwest-----	104.1	103.1	202.6	89.5	99.7	103.5	37.2	101.5	107.1	26.3	28.3	62.7
South-----	95.6	163.0	80.0	57.1	111.6	103.7	56.4	112.2	78.9	23.9	38.5	21.8
West-----	138.6	125.8	-	40.9	311.2	131.0	215.6	173.9	99.1	63.6	88.7	74.9
Lids, sclerae, conjunctivae:												
Northeast-----	55.9	92.6	47.0	23.9	33.3	70.3	62.7	73.9	42.3	40.8	64.0	25.5
Midwest-----	10.8	-	37.9	-	31.0	-	-	10.2	11.3	7.4	10.2	12.1
South-----	34.7	62.3	62.0	9.0	35.6	-	35.1	33.4	36.0	6.5	11.8	6.1
West-----	41.2	34.1	-	-	53.9	131.0	39.7	29.2	54.5	23.9	29.8	51.1
Pupils, iridis:												
Northeast-----	33.7	-	-	57.4	35.7	-	123.8	44.2	25.9	25.5	44.9	24.4
Midwest-----	12.2	36.8	-	-	-	-	37.2	10.8	13.8	13.7	10.7	18.0
South-----	6.0	-	-	-	24.2	-	15.3	3.0	9.1	4.6	3.4	7.4
West-----	5.8	28.1	-	-	-	-	-	11.1	-	5.6	10.8	-
Tropia (manifest strabismus):												
Northeast-----	10.8	-	-	28.7	-	45.0	-	25.1	-	7.8	19.5	-
Midwest-----	25.6	-	82.8	-	37.7	39.4	-	25.8	25.5	7.5	18.6	8.8
South-----	31.6	48.3	-	48.0	30.8	61.6	-	49.0	14.0	18.0	32.8	7.8
West-----	79.1	63.6	-	40.9	213.8	-	144.2	121.5	31.7	52.2	87.1	16.8
All other extraocular muscle conditions:												
Northeast-----	10.0	50.2	-	-	-	-	-	-	17.5	6.0	-	10.5
Midwest-----	68.5	66.2	81.8	89.5	31.0	103.5	37.2	79.2	56.4	23.1	12.2	47.3
South-----	28.5	36.4	10.8	12.2	61.1	42.1	10.8	34.1	22.9	19.4	22.1	19.5
West-----	12.3	-	-	-	43.4	-	31.6	12.0	12.7	12.0	11.9	12.3
Latent strabismus:												
Northeast-----	-	-	-	-	-	-	-	-	-	-	-	-
Midwest-----	27.1	36.8	43.9	-	-	78.8	-	38.8	13.8	15.9	13.4	18.0
South-----	8.8	13.7	-	12.2	27.0	-	-	12.8	4.8	6.8	8.7	5.1
West-----	6.0	-	-	-	-	-	31.6	-	12.7	5.8	-	12.3

APPENDIX B

RESULTS OF OPTOMETRIC ORTHOPTICS

Study	Number of Cases	Cosmetically and Functionally Successful	% Functional Cure	Cosmetically Successful	% Overall Functional and Cosmetic Cured
Layland ¹⁶	107	72	67%	19	85%
Etting ¹⁷	42	27	64%	6	79%
Etting ¹⁹	86	61	71%	16	90%
Ludlam ⁵ (almost cured and cured both counted as functional result)	149	109	73%	4	76%
Hoffman, et. al. ²⁰	55	63	87%	—	87%
TOTALS	439	332	76%	44	86%

RESULTS OF OPHTHALMOLOGICAL-ORTHOPTIST ORTHOPTICS

Study	Number of Cases	Cosmetically and Functionally Successful	% Functional Cure	Cosmetically Successful	% Overall Functional and Cosmetic Cured
Chryssanthou ⁶ (good or excellent both counted as functional result)	27	18	67%	—	67%
SanFilippo and Clahane ⁷ (good and excellent counted as functional result)	31	23	74%	—	74%
Altizer ⁸	23	10	43%	—	43%
Gillan ⁹	63	23	37%	25	76%
Guibor ^{10, 11, 12, 13}	38	19	50%	13	84%
Zaki ¹⁴ (Note: Others might have considered the 17 "cosmetic" cures as functional cures — see text)	125	75	60%	17	74%
Cooper and Lyman ¹⁵	182	107	59%	—	59%
TOTALS	489	275	56%	45	67%

Please complete the questionnaire and mail to Donald Johnson, Pacific University, College of Optometry 2043 College Way, Forest Grove, OR 97116

Name _____ Date of Birth _____ Age _____ Sex: M _____ F _____

PATIENT HISTORY

Today's Date _____

Part A

1. Age at onset of strabismus (wandering eye): _____
2. Age at which glasses were first prescribed: _____
3. Age at beginning of vision therapy: _____
4. List surgery and/or therapy prior to training (including drops or patching): _____

5. List surgery and/or therapy since training (including drops or patching): _____

6. Any illness or high fever at the onset of strabismus? _____
7. Any illness or high fever since training? _____
8. Any medications used regularly since training? _____
9. Present medications taken regularly: _____
10. Present health status: Good _____ Fair _____ Poor _____
11. List family/relatives who have had strabismus: _____

Part B

- | | Yes | No |
|--|-------|-------|
| 1. Are you satisfied with the way your eyes have been working?
If no, explain: _____ | _____ | _____ |
| 2. Do you feel you are using both of your eyes? | _____ | _____ |
| 3. Do you see better with one eye than the other?
Has one eye been getting worse? | _____ | _____ |
| 4. Does one eye ever wander?
Percent of time it wanders: _____
Under what conditions? _____
Compared to before training: More _____ or Less _____
Are you aware of it wandering? _____
Do other people have to tell you about it wandering? _____
Do you see double if your eye wanders? _____ | _____ | _____ |
| 5. Are you aware of one eye ever turning off?
Percent of time it turns off: _____
Under what conditions? _____
Compared to before training: More _____ or Less _____ | _____ | _____ |
| 6. Do you consider your eyes properly aligned? | _____ | _____ |

Part B (Cont.)

7. Do you ever experience any of the following:

	<i>Yes</i>	<i>No</i>	<i>How Often (Percent of time)</i>	<i>Under What Conditions:</i>
blur	_____	_____	_____	_____
double vision	_____	_____	_____	_____
burning eyes	_____	_____	_____	_____
tired eyes	_____	_____	_____	_____
itchy eyes	_____	_____	_____	_____
eye discomfort	_____	_____	_____	_____
headaches	_____	_____	_____	_____
dizziness	_____	_____	_____	_____
nausea	_____	_____	_____	_____

8. Do your eyes ever bother you in the following activities?

	<i>Yes</i>	<i>No</i>	<i>How Often (Percent of time)</i>
while playing	_____	_____	_____
at school	_____	_____	_____
while reading	_____	_____	_____
doing homework	_____	_____	_____
when tired	_____	_____	_____
when upset	_____	_____	_____
watching T.V.	_____	_____	_____
on the job	_____	_____	_____

THANK YOU FOR YOUR PARTICIPATION.

Appendix DAnalytic Examination

- 1 Ophthalmoscopy
- 2 Keratometry
- 3 Habitual phoria at far
- 13A Habitual phoria at near
- 4 Retinoscopy
- 7Am Monocular to SBV
- 7 Binocular to 20/20
- 7A Binocular to SBV

All tests through habitual Rx at far and at near.

- 9 True adduction at far
- 10 Convergence at far
- 11 Abduction at far
- 12P Vertical phoria at far
- 12D Vertical vergence at far
- 16A Positive Relative Convergence at near
- 16B Positive Fusional Range
- 17A Negative Relative Convergence at near
- 17B Negative Fusional Range
- 18P Vertical phoria at near
- 18D Vertical vergence at near
- 21 Negative Relative Accommodation
- 20 Positive Relative Accommodation
- 19 Amplitude of Accommodation

APPENDIX E

Strabismus EvaluationAngle

Cover test
Cover test with neutralizing prism
Perimeter
Subjective angle in troposcope
Objective angle in troposcope
Bagolini lenses with cover test
Keystone

Eccentric Fixation

M.L.F.
Visuoscope
Haidinger with and without transferred after image
Hering-Bielschowsky A.I. with eyes open and closed

Anomalous Retinal Correspondence

Brock string with red-green filters
Bagolini lenses with cover test
Troposcope objective angle minus subjective angle
Haidinger Brush with transferred after-image
Hering-Bielschowsky A.I. with eyes open and closed

Suppression

Worth 4-dot
Randot stereoacuity
Brock string with and without red-green filters
Subjective response in troposcope

Please complete the questionnaire and mail to Donald Johnson, Pacific University, College of Optometry 2043 College Way, Forest Grove, OR 97116

Name _____ Date of Birth _____ Age _____ Sex: M _____ F _____

PATIENT HISTORY

Today's Date _____

Part A

1. Age at onset of strabismus (wandering eye): _____ 3-9 years
2. Age at which glasses were first prescribed: _____ 4-9 years
3. Age at beginning of vision therapy: _____ 7-11 years
4. List surgery and/or therapy prior to training (including drops or patching): _____ none
5. List surgery and/or therapy since training (including drops or patching): _____ none
6. Any illness or high fever at the onset of strabismus? _____ none
7. Any illness or high fever since training? _____ none
8. Any medications used regularly since training? _____ none
9. Present medications taken regularly: _____ none
10. Present health status: Good 7 Fair _____ Poor _____
11. List family/relatives who have had strabismus: _____ 3

Part B

- | | Yes | No |
|--|----------|----------|
| 1. Are you satisfied with the way your eyes have been working? | <u>7</u> | <u>0</u> |
| If no, explain: _____ | | |
| 2. Do you feel you are using both of your eyes? | <u>7</u> | <u>0</u> |
| 3. Do you see better with one eye than the other? | <u>0</u> | <u>7</u> |
| Has one eye been getting worse? _____ | | |
| 4. Does one eye ever wander? | <u>2</u> | <u>5</u> |
| Percent of time it wanders: <u>not specified</u> | | |
| Under what conditions? <u>strain, fatigue, reading, near to far to near vision</u> | | |
| Compared to before training: More _____ or Less <u>2</u> | | |
| Are you aware of it wandering? | | |
| | <u>1</u> | <u>1</u> |
| Do other people have to tell you about it wandering? | | |
| | <u>1</u> | <u>1</u> |
| Do you see double if your eye wanders? | | |
| | <u>1</u> | <u>1</u> |
| 5. Are you aware of one eye ever turning off? | <u>1</u> | <u>6</u> |
| Percent of time it turns off: <u>not specified</u> | | |
| Under what conditions? <u>stress</u> | | |
| Compared to before training: More _____ or Less <u>1</u> | | |
| 6. Do you consider your eyes properly aligned? | <u>7</u> | <u>0</u> |

Part B (Cont.)**7. Do you ever experience any of the following:**

	<i>Yes</i>	<i>No</i>	<i>How Often (Percent of time)</i>	<i>Under What Conditions:</i>
blur	1	6		
double vision	2	5		
burning eyes	3	4		
tired eyes	2	5		
itchy eyes	2	5		
eye discomfort	0	7		
headaches	1	0		
dizziness	0	7		
nausea	0	7		

8. Do your eyes ever bother you in the following activities?

	<i>Yes</i>	<i>No</i>	<i>How Often (Percent of time)</i>
while playing	0	7	
at school	1	6	
while reading	4	3	
doing homework	2	5	
when tired	3	4	
when upset	0	7	
watching T.V.	0	7	
on the job	0	7	

THANK YOU FOR YOUR PARTICIPATION.

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