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Symptoms in Children with Intermittent Exotropia and Their Impact on Health-Related Quality of Life

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Abstract

Purpose—In childhood intermittent XT the frequency and type of symptoms has not been rigorously studied. We aimed to identify specific symptoms in children with intermittent XT, their frequency, and effects on health-related quality of life (HRQOL).

Methods—35 children (5–13 years) with intermittent XT, without previous surgery were enrolled in a prospective cohort study. Specific symptoms were identified from a previous study involving child and parent interviews and formulated as a 22-item symptom questionnaire. A frequency Likert-type rating scale was used and a response of “sometimes” or more was considered consistent with having the symptom. All 35 children, along with one parent for each child, also completed the patient-derived intermittent XT HRQOL questionnaire (IXTQ) with Child, Proxy and Parent components. The frequency of symptoms was calculated, and the relationship between individual symptom question scores and Child, Proxy and Parent HRQOL scores, was evaluated in multivariate linear regression analyses.

Results—The mean number of specific symptoms was 7 (range 2 to 19). The most frequently reported were: rubbing the eye (29 [83%] of 35), problems with eyes in the sun and the eyes feeling tired (each 22, 63%). Lower (worse) Child IXTQ HRQOL scores were associated with symptoms of difficulty focusing eyes ($P=0.0007$), double vision ($P=0.007$), eyes hurting ($P=0.006$), and problems with eyes in the sun ($P=0.06$). There were weak associations between Proxy IXTQ and Parent IXTQ scores and child symptoms. Overall, 7 symptom questions were associated with reduced HRQOL in multivariate models.

Conclusion—Children with intermittent XT frequently experience symptoms, some of which impact the child’s HRQOL. Formal assessment of symptoms may aid understanding of the effects of intermittent XT on an individual child, and could use just the seven symptom questions associated with reduced HRQOL.

Keywords

exotropia; intermittent; questionnaire; symptoms

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DECLARATION OF INTEREST

The authors report no conflicts of interest.

INTRODUCTION

Intermittent exotropia (XT) is estimated to affect 32.1/100,000 children under 19 years of age in the United States of America, (Govindan et al., 2005) and occurs more frequently in Asian populations (Chia et al., 2007, Matsuo & Matsuo, 2005) and in females. (Nusz et al., 2005) Onset has been reported to be typically in the first year of life. (Costenbader, 1950) Although there are many studies evaluating treatment for intermittent XT, (Coffey et al., 1992, Cooper & Medow, 1993, Hatt & Gnanaraj, 2013) and some studies evaluating the effects of intermittent XT on health-related quality of life (HRQOL), (Hatt et al., 2008, Hatt et al., 2010) few studies assess the frequency and type of symptoms experienced by children with intermittent XT. Evaluation of symptoms attributable to intermittent XT may help clarify indications for treatment. The aim of this present study was to determine the type and frequency of symptoms in children with intermittent XT and evaluate associations with HRQOL.

MATERIALS AND METHODS

Before commencement of the study Institutional Review Board approval was obtained from the Institutional Review Board at the Mayo Clinic, Rochester, MN for data collection and analysis. All procedures and data collection were conducted in a manner compliant with the Health Insurance Portability and Accountability Act. All research procedures adhered to the tenets of the Declaration of Helsinki. All included subjects provided informed consent and/or informed assent before completing any study procedures.

Patients for derivation of items for symptom questionnaire

Individual items for the symptom questionnaire were identified from interviews of 24 children with intermittent XT, conducted as part of a previous study. (Hatt et al., 2008, Hatt et al., 2010) As reported previously, (Hatt et al., 2008), interviewed children were aged 5 to 17 years and had a diagnosis of divergence excess or basic type intermittent XT. One parent was interviewed for each child.

Formulating symptom questions from interview transcripts

For this present study the original child and parent interview transcripts (Hatt et al., 2008) were re-reviewed in order to identify unique statements or phrases describing vision-related symptoms. Previously we were interested in identifying health-related quality of life (HRQOL) concerns and therefore intentionally excluded statements or phrases that described symptoms alone (Hatt et al., 2008). Two reviewers independently read through each interview transcript and recorded all symptoms mentioned either by the child themselves or their parent. A symptom only needed to be mentioned once to be included. Although symptoms are typically expressed by the patient themselves, we elected to also include child symptoms as noticed by the parent. This allowed us to provide an initial inclusive list of symptoms (for further evaluation by both the child and the parent), and also allowed for the possibility that some children may not be able to clearly articulate their experience themselves, whereas the parent may be able to express it for them. As is common practice when developing patient-derived outcome measures, the question was formulated

using the actual verbiage employed by the patient themselves (or their parent) when describing the symptom.

Symptom questionnaire - format and delivery

Unique symptoms were formulated into 22 individual questions (Table 1) and formatted into two age-specific symptom questionnaires. We chose to format the questionnaires so that they were similar to previous child HRQOL questionnaires,, (Hatt et al., 2010, Varni et al., 2005) and chose to use a frequency response scale for responses since this is commonly used and has worked well for us in other projects. For 5- to 7-year-olds, language was simplified and a 3-point Likert-type scale was used for responses ('Not at all', 'Sometimes', 'A lot') as well as the option to respond 'I don't know.' Similar to the well-established PedsQL questionnaires, (Varni et al., 2005) when necessary we used a matching card with face symbols to aid young children in selecting a response. For each possible response, the descriptor ('Not at all', 'Sometimes', 'A lot') was read by the examiner when pointing to the corresponding face symbol, to minimize any confusion. Questionnaires were read verbatim, by a trained examiner, in a neutral tone of voice. For 8- to 17-year-olds a 5 point Likert type scale was used for responses ('Never', 'Almost never', 'Sometimes', 'Often', 'Almost always') as well as the option to respond 'I don't know.' Eight- to 17-year-old questionnaires were self-administered following simple verbal and written instructions, with supervision as necessary (depending on the child) by a trained examiner. If a child expressed that they did not understand a question, it was read (or for 5–7 year olds, re-read) verbatim by a trained examiner, without any explanation or elaboration, to address any errors that may have occurred when reading or hearing the question the first time around. Inability to respond despite repeating the question was recorded as 'I don't know.' Parents were instructed not to interfere with their child's responses and communication (verbal and non-verbal) between child and parent was limited by positioning the child with their back to their parent whenever possible.

Intermittent Exotropia HRQOL Questionnaire

All recruited children also completed the Intermittent Exotropia Questionnaire (IXTQ), a patient-derived, condition-specific, Rasch-analyzed HRQOL questionnaire. (Hatt et al., 2010, Leske et al., 2015) The IXTQ consists of 5 components: Child, Proxy, Parent Psychosocial, Parent Function, Parent Surgery (available at: www.pedig.net accessed February 22, 2016). The Child IXTQ consists of 12 questions (Table 2) and is formatted using a 3-point Likert-type scale ('Not at all', 'Sometimes', 'A lot') for 5–7-year olds and a 5-point Likert-type scale ('Never', 'Almost never', 'Sometimes', 'Often', 'Almost always') for 8–17-year olds. The Proxy IXTQ consists of the same 12 questions as the Child IXTQ, but phrased for the parent regarding their child. The Parent Psychosocial IXTQ consists of 7 questions, the Parent Function 8 questions and the Parent Surgery 2 questions (Table 3).

Both the symptom questionnaire (completed first) and the HRQOL questionnaire, were completed during the child's outpatient appointment. For some patients, questionnaires were administered before the clinical examination was performed, and for others the questionnaires were administered after the clinical examination was completed. The timing was entirely dependent on what was least disruptive to the clinical examination.

Patients for study of symptoms and HRQOL

A convenience sample of 35 children with intermittent XT (aged 5–13, median 7 years) were prospectively enrolled from pediatric ophthalmology outpatient clinics at a single institution, for the assessment of the symptom questionnaire and IXTQ. Included children were enrolled while undergoing a routine follow-up examination for intermittent XT, and had been initially referred to ophthalmology for a variety of reasons including failed preschool / school vision screening or parental observation of the strabismus. Most children were not referred due the presence of symptoms and were not actively pursuing surgical correction. Intermittent XT measuring at least 10 pd at distance by prism and alternating cover test (PACT) was eligible for inclusion. Basic, true divergence excess and pseudo divergence excess types were included (convergence insufficiency type excluded) and both the child and the parent were required to be comfortably conversant in English. We excluded patients who had undergone previous strabismus surgery and those with developmental delay.

Analysis

For analysis of symptom frequency, responses of “I don’t know,” “Not at all,” “Never” and “Almost never” were defined as not having the symptom, and responses of “Sometimes,” “Often,” “Almost always” or “A lot” were taken to indicate the symptom was present. The overall frequency of symptoms (rated sometimes or more) was calculated.

To evaluate the relationship between symptoms and IXTQ scores, symptom responses were converted to a 0 to 4 scale (“Never” and “I don’t know” =0, “Rarely” =1, “Sometimes” =2, “Often” =3 “Almost always” and “A lot” =4). For each component of the IXTQ, scores were calculated using Rasch look-up tables (available at: www.pedig.net accessed February 22, 2016) and then converted to a 0–100 score (worst to best HRQOL) for easier interpretation. Each of the 5 components of the IXTQ (Child, Proxy, Parent Psychosocial, Parent Function, Parent Surgery), was scored and analyzed separately. Univariate and multivariate linear regression analyses were performed. Symptoms associated with IXTQ score ($P < 0.1$) in univariate analysis were fit to a stepwise multivariate linear regression model. To account for the possibility of highly correlated symptoms we performed a Spearman rank correlation analysis, planning to analyze highly correlated items ($r > 0.6$) in separate regression models.

RESULTS

Patients

Eighteen of 35 children were aged 5 to 7 years and 17 were aged 8 to 13 years. Median angle of deviation by PACT was 20 pd (range 12 to 55 pd) at distance and 14 pd (range 0 to 37 pd) at near. Thirteen (37%) wore refractive correction. Twenty (57%) of 35 were female and for 32 (91%) race was self-reported as ‘White.’

Frequency and type of symptoms

The mean number of symptoms reported per child was 7 (range 2 to 9 symptoms). The most frequently reported symptom was rubbing the eyes (83%), followed by eyes feeling tired (63%) and problems with eyes in the sun (63%) (Table 1). Shutting one eye, seeing to the side and straight ahead at the same time (panoramic vision) and blinking were also

mentioned by approximately half of patients (Table 1). Interestingly, 29% of children reported diplopia.

Associations with IXTQ score

Univariate linear regression analysis—Twelve symptoms were associated ($p < 0.1$) with lower IXTQ scores (reduced HRQOL) on the Child IXTQ, four on the Proxy IXTQ, two on the Parent Psychosocial IXTQ, and three on the Parent Function IXTQ (Table 4). No symptoms were independently associated with Parent Surgery IXTQ scores.

Multivariate linear regression analysis—In multivariate linear regression analyses, lower Child IXTQ scores were associated with four symptoms: finding it hard to focus the eyes ($P = 0.0007$, $r\text{-square} = 0.2576$), eyes hurting ($P = 0.006$, $r\text{-square} = 0.1234$), double vision ($P = 0.007$, $r\text{-square} = 0.2077$), problems with the eyes in the sun ($P = 0.06$, $r\text{-square} = 0.0508$, Table 5).

Lower Proxy IXTQ scores were associated with two symptoms: eyes feeling funny ($P = 0.02$, $r\text{-square} = 0.1767$) and eyes going in and out ($P = 0.06$, $r\text{-square} = 0.0907$, Table 5). For Parent Psychosocial IXTQ, two symptoms were associated: eyes going in and out ($P = 0.02$, $r\text{-square} = 0.0937$) and hard to stare at things ($P = 0.03$, $r\text{-square} = 0.1314$, Table 5). Parent Function IXTQ was associated with one symptom: eyes going in and out ($P = 0.04$, $r\text{-square} = 0.1183$, Table 5).

Two symptom questionnaire items (#6 and #15 Table 1) were found to be highly correlated ($r = 0.6$), but since neither were retained in the multivariate model there was no need to create additional multivariate models to account for correlated items.

DISCUSSION

Children with intermittent XT frequently report symptoms such as having to rub their eyes, their eyes feeling tired, and having problems with their eyes in the sun. Symptoms were also found to be associated with reduced child HRQOL, specifically difficulty focusing the eyes, experiencing double vision, the eyes hurting, and having problems with the eyes in the sun. We also found associations between specific symptoms and reduced Proxy and Parent HRQOL. These findings suggest that it may be beneficial to formally collect data on symptoms in addition to measuring vision-related HRQOL in children with intermittent XT.

Intermittent XT in children is generally thought to be asymptomatic due to the presence of well-developed suppression mechanisms. (Burke, 1985, Clarke, 2007, Santiago et al., 1999, von Noorden & Campos, 2002) Nevertheless, two specific symptoms are well-recognized features of childhood intermittent XT: closure of one eye in bright sunlight and/or sensitivity to sunlight, (Campos & Cipolli, 1992, Eustace et al., 1973, Wang & Chryssanthou, 1988, Wiggins & von Noorden, 1990) and panoramic vision. (Cooper & Feldman, 1979) These symptoms were among the top five rated by children in this present study. It has been variously suggested that sensitivity to light and closure of one eye in bright light occur due to reduced binocularity, (Campos & Cipolli, 1992) in order to reduce photophobia, (Wiggins & von Noorden, 1990) or to eliminate diplopia and visual confusion. (Wang & Chryssanthou,

1988) Wiggins and von Noorden (Wiggins & von Noorden, 1990) reported monocular eye closure in bright light in 63% of patients with intermittent XT, and Wang and Chrysanthou (Wang & Chrysanthou, 1988) in 76%. These previous reports are comparable with the present study; 63% reporting problems with their eyes in the sun and 49% shutting one eye. There are few previous data on the prevalence of panoramic vision in children with intermittent XT, perhaps because verifying its existence requires additional testing. It is interesting that based on subjective report, half (49%) of the children in this present study identified as experiencing panoramic vision.

We are unaware of previous studies aiming to identify the spectrum of symptoms occurring in children with intermittent XT, or the frequency with which they occur. We found the most frequently reported symptoms were rubbing the eyes (83%), the eyes feeling tired (63%), and problems with their eyes in the sun (63%). Rubbing the eyes may be expected with ocular discomfort, so it is interesting to note that only 6% of children also reported that their eyes hurt. It is possible that co-existing symptoms such as sensitivity to light, or finding it hard to focus the eyes may lead to children rubbing their eyes.

The presence of well-developed suppression mechanisms in childhood intermittent XT has been cited as an explanation for the apparent absence of diplopia in most patients. (Pratt-Johnson & Wee, 1969) Nevertheless, in this present study we found 29% of children reported diplopia, a much higher rate than reported in previous studies. In a retrospective population-based study by Nusz et al, (Nusz et al., 2006) the incidence of diplopia was 4.3% of 184 children with intermittent XT. In a previous study by our group, interviewing children with intermittent XT, we found only 4% (of 24 children) volunteered that they were bothered by diplopia. (Hatt et al., 2008, Hatt et al., 2009) The increased rate of diplopia found in this present study may be a function of directly asking the patient whether or not they experience diplopia, rather than basing the presence versus absence of diplopia on volunteered information. In addition, it is notable when reviewing previous studies of children with intermittent XT, that very few report any data regarding diplopia, further suggesting that the presence of diplopia in intermittent XT may be under-reported. Alternatively it is possible that the diplopia rate reported in this present study may be overestimated with patients not fully understanding what the term double vision means.

We found that nearly half of children reported blinking to control their eyes (43%) or blinking a lot (40%). These data are consistent with previous work by Stella, who reported that blink vergence mechanisms aid re-fusion of the exodeviation in intermittent XT. (Stella, 1968) In another study, evaluating 99 consecutive children presenting with excessive blinking, intermittent XT was found to be the primary cause in 11% of cases. (Coats et al., 2001) It is therefore not too surprising that when directly questioned, blinking a lot or blinking to control the eyes was reported by a large proportion of patients.

When evaluating associations between specific symptoms and reduced HRQOL we found that, based on the child's report, reduced HRQOL was associated with symptoms of the eyes hurting, double vision, problems with the eyes in the sun, and finding it hard to focus the eyes. Although some of these symptoms were not frequently reported by children, the association with reduced HRQOL suggests that when present they have significant impact,

and that therefore consideration should be given to addressing those specific symptoms. It might be reasonable and more time-efficient to administer a shortened version of this symptom questionnaire that would be composed only of the seven questions associated with reduced HRQOL (Table 5).

We also found associations between reduced proxy-reported HRQOL and specific child symptoms, although the overall association was not as strong as that found for child-reported HRQOL. Reduced proxy-reported HRQOL was associated with different symptoms than those found when HRQOL was reported by the child themselves. Proxy-reported HRQOL was associated with the eyes feeling funny and the eyes going in and out. It is well reported that differences often exist between child- and proxy-reported HRQOL. (Burks et al., 2013, Cremeens et al., 2006, Jardine et al., 2014) Although several possibilities for child / proxy differences exist, it may simply be that parents were more aware of these specific symptoms, and that this drove the association with proxy-reported HRQOL.

Interestingly we found associations between the parent's own HRQOL and child symptoms of the eyes going in and out and finding it hard to stare at things. Although the association was less strong than that found when assessing child HRQOL, it is important to be aware that the presence of symptoms in the child may adversely affect the parent's own HRQOL. The association of symptoms with reduced HRQOL across child, proxy and parent questionnaires may help direct future refinement of the symptom questionnaire. One potential option would be to create a short symptom survey that only includes questions that were found to impact HRQOL.

There are several limitations to this study. We were only able to recruit a relatively small number of children and the frequency of specific symptoms may be different in a larger, more heterogeneous population. In addition, it would have been preferable to have a larger population for our regression analyses. It is possible that we missed some associations due to our sample size. Future studies should evaluate symptoms and HRQOL in such large, more diverse cohorts. Although the symptom questionnaire and IXTQ HRQOL questionnaire were derived from the same interviews, it is entirely possible that a specific symptom does not lead to reduced HRQOL due to that specific symptom. A strength of our study is that we evaluated an entirely new cohort to address the question of which symptoms are associated with reduced HRQOL. We had no control group in this initial study of symptoms since our aim was to identify specific symptoms occurring in children with intermittent XT. In future studies it will be helpful to compare the frequency of these symptoms in children with intermittent XT, compared with a control group without strabismus. It may also be helpful to look at separate sub-groups such as children with and without spectacle correction. Finally, it is possible that there was undue burden of testing for young children answering a total of 34 questions. However we have successfully administered this number of questions to young children before (Hatt et al., 2010) and feel that burden of testing was not unreasonable in the present study. A future intermittent XT symptom survey could justifiably use only the seven questions associated with reduced HRQOL, further reducing testing burden.

Children with intermittent XT frequently report a variety of symptoms, and therefore we suggest consideration be given to incorporating a formal assessment of symptoms into

standard clinical assessment. Such formal assessment of symptoms may yield important information regarding how intermittent XT affects an individual child in their everyday life. Using a written symptom survey (perhaps a shortened version of that reported in this present study such as the seven questions associated with reduced HRQOL [Table 5]) would provide a standardized patient-reported outcome measure that may help identify the severity of symptoms at a given point in time, as well as change over time, or in response to treatment. In addition to formally collecting data on symptoms, collecting data on HRQOL using the IXTQ provides information regarding the extent to which symptoms impact the child's everyday life and may help to direct management.

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Table 1

Intermittent Exotropia Symptom Questionnaire Showing Proportion with Symptoms Rated “Sometimes” or More on the Questionnaire.

Symptom questionnaire items ^a	Proportion with symptoms present
1. Can you tell your eye is wandering?	9/35; 26%
2. Do you have blurry or fuzzy vision?	6/35; 17%
3. Do you have to blink to control your eyes?	15/35; 43%
4. Do your eyes hurt?	2/35; 6%
5. Do your eyes feel tired?	22/35; 63%^b
6. Do your eyes feel funny?	7/35; 20%
7. Can you see around to the side and straight ahead at the same time?	17/35; 49%^b
8. Do you have double vision (do you see two of things when you know there is really only one)?	10/35; 29%
9. Is it hard for you to stare at things?	10/35; 29%
10. Do you have problems seeing how far away things are?	12/35; 34%
11. Do you have problems with your eyes in the sun?	22/35; 63%^b
12. Do you need to pull your eyes in?	5/35; 14%
13. Do your eyes make you feel dizzy?	5/35; 14%
14. Do you find it hard to see things?	7/35; 20%
15. Do your eyes feel weird?	7/35; 20%
16. Do you have to shut one eye?	17/35; 49%^b
17. Do other people tell you that your eye is wandering?	10/35; 29%
18. Do you rub your eyes?	29/35; 83%^b
19. Do you have problems reading?	10/35; 29%
20. Do your eyes go in and out?	7/35; 20%
21. Is it hard to focus your eyes?	11/35; 31%
22. Do you have to blink a lot?	14/35; 40%

^aResponse options for 8- to 17-year olds were: Never, Almost Never, Sometimes, Often, Almost Always and I don't know and for 5- to 7- year olds were: Not at all, Sometimes, and A lot.

^bBolded items indicate the 5 most frequently rated symptoms

Table 2

Child Intermittent Exotropia Health-Related Quality of Life Questionnaire, Showing Questions as Phrased for 8- to 17-Year-Old Children

Child Intermittent Exotropia Questionnaire items ^a
1. I worry about my eyes
2. It bothers me that people wonder what is wrong with my eyes
3. It bothers me because I have to wait for my eyes to clear up
4. Kids tease me because of my eyes
5. I am bothered when grownups say things about my eyes
6. I am bothered when my parents say things about my eyes
7. It bothers me that I have to shut one eye when it is sunny
8. I feel different from other kids because my eyes go in and out
9. I worry about what other people think of me because of my eyes
10. My eyes make it hard to look people in the eye
11. It is hard to concentrate because of my eyes
12. My eyes make it hard for me to make friends

^aResponse options for 8- to 17-year olds were: Never, Almost Never, Sometimes, Often, Almost Always and for 5-to 7-year olds were: Not at all, Sometimes, and A lot.

Table 3

Parent Intermittent Exotropia Health-Related Quality of Life Questionnaire Showing Function, Psychosocial and Surgery Domains

Parent Intermittent Exotropia Questionnaire items^a	
Function domain	
I worry that my child will be less independent because of his/her eyes	
I worry about my child's eyes	
I worry that my child doesn't see well	
I worry that my child will get hurt physically because of his/her eyes	
I worry that my child will not be able to see the board at school	
I worry about my child's eyesight long term	
I worry about my child's depth perception	
I worry that my child will have permanent damage to his/her eyes	
Psychosocial domain	
I worry that my child's eye condition will affect his/her personality	
I worry that my child's eyes will affect his/her social life if nothing is done	
I worry about my child becoming self-conscious because of his/her eyes	
I worry about other kids teasing my child because of his/her eyes	
It worries me what others will think about my child because of his/her eyes	
I worry about how my child's eyes will affect him/her socially	
I worry about my child's ability to make friends	
Surgery domain	
I worry about whether or not my child should have surgery	
I worry about the possibility of surgery	

^aResponse options were: Never, Almost Never, Sometimes, Often, and Almost Always

Table 4

Univariate Linear Regression Analysis showing P values for associations between Intermittent Exotropia Questionnaire (IXTQ) Scores and Symptom Scores.

	Symptom questionnaire item	Child IXTQ	Proxy IXTQ	Parent Psychosocial IXTQ	Parent Function IXTQ	Parent Surgery IXTQ
1	Tell eye is wandering	>0.1	0.09	>0.1	>0.1	>0.1
2	Blurry or fuzzy vision	>0.1	>0.1	>0.1	>0.1	>0.1
3	Blink to control eyes	>0.1	>0.1	>0.1	0.07	>0.1
4	Eyes hurt	0.03	>0.1	>0.1	>0.1	>0.1
5	Eyes feel tired	>0.1	>0.1	>0.1	>0.1	>0.1
6	Eyes feel funny	0.02	0.01	>0.1	>0.1	>0.1
7	See to side and straight ahead	>0.1	>0.1	>0.1	>0.1	>0.1
8	Double vision	0.006	0.05	>0.1	>0.1	>0.1
9	Hard to stare at things	>0.1	>0.1	0.09	>0.1	>0.1
10	Problems seeing how far things are	0.08	>0.1	>0.1	>0.1	>0.1
11	Problems with eyes in sun	0.008	>0.1	>0.1	>0.1	>0.1
12	Need to pull eyes in	>0.1	>0.1	>0.1	>0.1	>0.1
13	Eyes make you feel dizzy	0.01	>0.1	>0.1	>0.1	>0.1
14	Hard to see things	0.02	>0.1	>0.1	>0.1	>0.1
15	Eyes feel weird	0.02	>0.1	>0.1	>0.1	>0.1
16	Have to shut one eye	>0.1	>0.1	>0.1	>0.1	>0.1
17	People tell you your eye is wandering	>0.1	>0.1	>0.1	0.098	>0.1
18	Rub your eyes	>0.1	>0.1	>0.1	>0.1	>0.1
19	Problems reading	0.02	>0.1	>0.1	>0.1	>0.1
20	Eyes go in and out	0.01	0.05	0.07	0.04	>0.1
21	Hard to focus eyes	0.003	>0.1	>0.1	>0.1	>0.1
22	Have to blink a lot	0.04	>0.1	>0.1	>0.1	>0.1

Bolded items indicate symptoms independently associated with reduced IXTQ scores.

Table 5

Multivariate Linear Regression of Intermittent Exotropia Questionnaire Scores and Symptom Scores.

	Symptom questionnaire item	Child IXTQ	Proxy IXTQ	Parent Psychosocial IXTQ	Parent Function IXTQ
1	Tell eye is wandering				
3	Blink to control eyes				
4	Eyes hurt	P=0.006 r-square=0.1234			
5	Eyes feel tired				
6	Eyes feel funny		P=0.02 r-square=0.1767		
7	See to side and straight ahead				
8	Double vision	P=0.007 r-square=0.2077			
9	Hard to stare at things			P=0.03 r-square=0.1314	
10	Problems seeing how far things are				
11	Problems with eyes in sun	P=0.06 r-square=0.0508			
13	Eyes make you feel dizzy				
14	Hard to see things				
15	Eyes feel weird				
17	People tell you your eye is wandering				
19	Problems reading				
20	Eyes go in and out		P=0.06 r-square=0.0907	P=0.02 r-square=0.0937	P=0.04 r-square=0.1183
21	Hard to focus eyes	P=0.0007 r-square=0.2576			
22	Have to blink a lot				
	Overall	P<0.0001 r-square=0.6395	P=0.008 r-square=0.2673	P=0.02 r-square=0.2251	P=0.04 r-square=0.1183

Bolded items indicate those retained in the multivariate regression model, and therefore association with reduced IXTQ scores.