Ophthalmic Abnormalities and Reading Impairment

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abstract

OBJECTIVES: To explore associations between specific learning disorder with impairment in reading (dyslexia) and ophthalmic abnormalities in children aged 7 to 9 years.

METHODS: Cross-sectional analysis was performed on cohort study data from the Avon Longitudinal Study of Parents and Children. Reading impairment was defined according to *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* criteria. Children who achieved >2 SD below the mean in the Neale Analysis of Reading Ability Scale II and level <4 in nonmathematical national key stage 2 tests were defined as having severe reading impairment (SRI). Children with blindness or IQ <70 were excluded.

RESULTS: Data were available for 5822 children, of whom 172 (3%) met the criteria for SRI. No association was found between SRI and strabismus, motor fusion, sensory fusion at a distance, refractive error, amblyopia, convergence, accommodation, or contrast sensitivity. Abnormalities in sensory fusion at near were mildly higher in children with SRI compared with their peers (1 in 6 vs 1 in 10, $P = .08$), as were children with stereoacuity worse than 60 seconds/arc (1 in 6 vs 1 in 10, $P = .001$).

CONCLUSIONS: Four of every 5 children with SRI had normal ophthalmic function in each test used. A small minority of children displayed minor anomalies in stereoacuity or fusion of near targets. The slight excess of these children among those with SRI may be a result of their reading impairment or may be unrelated. We found no evidence that vision-based treatments would be useful to help children with SRI.

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WHAT'S KNOWN ON THIS SUBJECT: Dyslexia has a lifelong impact on learning. The consensus in the literature from clinical studies is that dyslexia is not caused by vision abnormalities. However, interventions and therapies directed at eye-related functions are still available.

WHAT THIS STUDY ADDS: In this cohort the majority of dyslexic children had normal results for all ophthalmic tests. These population-based data support the consensus that dyslexia is not primarily a vision problem and that vision-based therapies are not justified or likely to help.

Specific learning disorder with reading impairment (dyslexia) affects 3% to 20% of school-aged children (~375 000 UK children[1]) depending on the definition used.[2] Reading difficulties have implications for adult life, including health and employment.[3] There is increasing emphasis on early detection and phonological intervention to improve outcomes in children with significant reading difficulties.[4,5] According to the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-V), children with specific learning disorder with reading impairment have long-term difficulties in word reading rate, accuracy, or comprehension that begin during school years and occur in the absence of a primary cause for reading difficulties, such as neurologic or school factors. The difficulty should have been present for ≥6 months and must affect either academic performance or activities of daily living.[6]

A number of neurodevelopmental conditions are associated with ophthalmic abnormalities.[7–9] Reading requires adequate vision and the neurologic ability to identify what is seen, and consequently the study of difficulties in vision and visual perception has been of interest in elucidating the pathophysiology of reading impairment.[10,11] Interestingly, recent work has shown age-appropriate levels of reading ability even in the presence of severe visual problems.[12,13]

The strong consensus of the scientific community is that reading problems, including dyslexia, are not caused by vision abnormalities.[10] This consensus has not yet been tested in a large population cohort.

A number of small, typically clinic- or school-based case–control studies have postulated associations between dyslexia and poor stereopsis,[14,15] abnormal fusion,[16] increased demand on sensory fusion processes,[17] abnormal convergence,[16,18] and reduced contrast sensitivity.[19,20] However, other studies have found no association between these abnormalities and dyslexia.[2,16,18,20–23] A descriptive review of 114 articles published from 2000 to 2012 found that eye movement anomalies, visual contrast deficits, and pseudoneglect were the main ophthalmic features associated with dyslexia.[24] It has been hypothesized that the abnormalities in eye movements are potentially the result, not the cause, of the condition.[10]

This study aims to investigate the association between DSM-V classified specific learning disorder with reading impairment and a range of ophthalmic abnormalities assessed at age 7, based on data from a large, prospectively collected UK birth cohort.

METHODS

Patients

The Avon Longitudinal Study of Parents and Children (ALSPAC) is a longitudinal birth cohort study of children born to mothers resident in Avon, UK who had an estimated delivery date between April 1, 1991 and December 31, 1992. Approximately 72% of eligible pregnant women were recruited. Participants gave informed consent before taking part. Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees.

Cross-sectional data were available from children aged 7 to 9 years. The Focus@7 assessment involved a comprehensive 20-minute protocol-driven orthoptic examination and completion of a questionnaire. The Focus@9 clinic involved completion of the Neale Analysis of Reading Ability Scale (NARA) II.

Ocular Assessment

Vision

- Amblyopia (lazy eye): The parent completed a questionnaire regarding any previous patching treatment, and current acuity was accurately tested in the clinic.
- Contrast sensitivity: Pelli–Robson chart for each eye.

Need for Glasses: Estimated Refractive Error

- Average of 3 measurements from each undilated eye, with a Cannon R50 autorefractor (Canon Medical Systems, Melville, NY). Likely hyperopia (farsightedness) was defined as autorefraction in either eye ≥+2.0D spherical equivalent and likely myopia (short-sightedness) as autorefraction ≥−1.5D spherical equivalent.

Eye Alignment: Strabismus (Squint)

- Assessed with the cover/uncover test and simultaneous prism cover test performed at near (33 cm) and distance (6 m). "Clinically significant" strabismus was defined as all manifest strabismus (deviation of 2 prism diopters [PD] or greater), or latent deviations of ≥10 PD if convergent (unaided at near) and ≥15 PD if divergent (unaided at distance).

Focusing and Forming a Single Image

- Sensory fusion (fusion of 2 slightly dissimilar images): Worth's 4-dots test, used with near (33 cm) and distance (6 m) viewing targets.
- Motor fusion (coordination of the eyes to deal with 2 images): Observed with a 20-diopter and then a 4-diopter prism and near target.
- Stereoacuity (depth perception): Randot Stereotest at 40 cm.
- Mean near point of convergence and mean unaided near point of accommodation (focusing at near): Royal Air Force rule.

Reading Assessment

Children's reading was assessed at 9 years on the NARA II (a standardized reading assessment tool suitable for children aged 6–12 years).[25,26] Reading speed, errors, and

comprehension were scored by trained psychologists. Children who were prescribed glasses for refractive error wore them. School-based educational assessments were performed as part of the National Curriculum Key Stage 2 at age 11 years, and data have been linked to ALSPAC unique identifiers.

Children who achieved scores <2 SD below the mean for any component of the NARA II and who also did not meet the national level of attainment in nonmathematic subjects at key stage 2 (ie, level <4 for key stage 2 in English or science) were defined as having severe reading impairment (SRI). Those who achieved <1 SD below the mean of the standardized speed, accuracy, or comprehension variables of the NARA II and who also did not meet the national level of attainment in nonmathematic subjects at key stage 2 (ie, level <4 for key stage 2 in English or science) were defined as having moderate reading impairment (MRI). Those with blindness or with an IQ <70 (assessed at 8 years of age) were excluded.

Confounders

Confounding factors were assessed within the data set and from the literature and were gender, low birth weight (≤2500 g), preterm birth (gestation <37 weeks), and maternal smoking.[27–31] IQ, used in secondary analyses, was measured on a short form of the Wechsler Intelligence Scale for Children.[32]

Statistical Analysis

Analyses were performed in Stata version 12 (Stata Corp, College Station, TX). After descriptive statistics were computed, cross-tabulations and regression models were used to calculate odds ratios (ORs) and 95% confidence intervals (CIs) to assess associations between reading impairment and ocular abnormalities, adjusting for potential confounders.

RESULTS

Reading impairment data were available for 6852 children, of whom 225 (3.3%) met the criteria for SRI. Another 624 children had MRI. Of these children, 5822 had previously attended the vision assessment at age 7 years and were included in the analysis. Figure 1 gives a breakdown of attendance at each of the relevant sessions.

Description of Nonparticipants

Children who did not attend the assessments were more likely to be male, to have mothers who had education at O level equivalent or less, to have parents in social class III or VI, and to have smoking mothers, compared with children who attended. This information is presented in Supplemental Table 4.

Description of Participants

Of the 5822 children who completed the reading and vision sessions, 3% (n = 172) had SRI, and ~8% (n = 479) had MRI.

Demographic details of the participants in relation to potentially confounding variables are listed in Table 1. Children with reading impairment were predominantly male, with overrepresentation of low birth weight, preterm birth, and children from families whose parents were from socioeconomic groups III and VI.

Table 2 lists the ophthalmic features, stratified by reading impairment category. This information is summarized in Figure 2. More than 80% of children with SRI had normal ophthalmic function with all tests used.

Table 3 presents unadjusted and adjusted logistic regression analyses looking at the association between SRI and visual difficulties. The adjusted model controls for gender, preterm birth, low birth weight, and maternal smoking.

In the adjusted model, the prevalence of stereoacuity worse than 60 seconds/arc was marginally higher in children with SRI when compared with the remaining children (OR = 1.58; 95% CI, 1.01–2.47). Additional adjustment for IQ reduced the effect size and expanded the 95% CI to include 1, increasing the likelihood of it being a chance finding (OR = 1.46; 95% CI, 0.88–2.42; P = .143).

The likelihood of abnormal near sensory fusion was also slightly higher in children with SRI (OR = 1.63; 95% CI, 1.02–2.60). This finding is illustrated in Fig 2, where a stepwise increase in children with stereoacuity worse than 60 seconds/arc and in children with abnormal near sensory fusion can be seen, in relation to severity of reading impairment. Additional adjustment for IQ, though controversial, decreased the association (OR = 1.65; 95% CI, 0.97–2.81; P = .066).

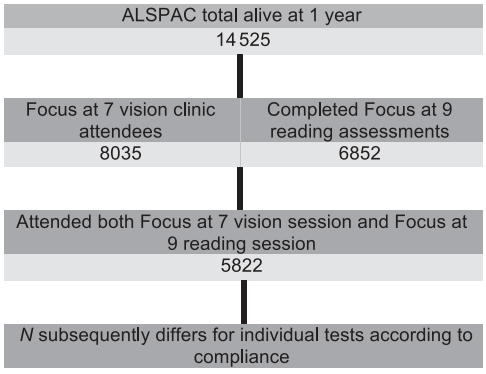

FIGURE 1
Flow diagram of denominator calculation.

TABLE 1 Demographics of the Children Who Entered Both the Reading and Vision Sessions as a Whole and Then Categorized by Presence and Severity of RI (total n = 5822)

	Attendees, n (%)	SRI, n (%)	MRI, n (%)	Typically Developing, n (%)	df, χ^2 Statistic (P)
Gender					
Male	2867 (49.2)	122 (70.9)	301 (62.8)	2444 (47.3)	2, 75.9 (<.001)
Female	2955 (50.8)	50 (29.1)	178 (37.2)	2727 (52.7)	
Missing	n = 0	n = 0	n = 0	n = 0	
Socioeconomic status					
I–II	1557 (30.1)	16 (11.7)	53 (13.3)	1488 (32.0)	2, 5.4 (.068)
III–VI	3621 (69.9)	121 (88.3)	345 (86.7)	3155 (68.0)	
Missing	n = 644	n = 35	n = 81	n = 528	
Gestation					
<37 wk	302 (5.4)	17 (10.7)	30 (6.7)	255 (5.1)	2, 83.8 (<.001)
≥37 wk	5263 (94.6)	142 (89.3)	419 (93.3)	4702 (94.9)	
Missing	n = 257	n = 13	n = 30	n = 214	
Birth weight					
<2500 g	263 (4.8)	13 (8.3)	25 (5.6)	225 (4.6)	2, 10.7 (.005)
≥2500 g	5240 (95.2)	143 (91.7)	421 (94.4)	4676 (95.4)	
Missing	n = 319	n = 16	n = 33	n = 270	
Maternal smoking					
No	4728 (86.3)	114 (73.6)	364 (82.5)	4250 (87.1)	2, 29.1 (<.001)
Yes, any	749 (13.7)	41 (26.5)	77 (17.5)	631 (12.9)	
Missing	345	n = 17	n = 38	n = 290	
Maternal education					
0 levels or less	3001 (55.5)	122 (80.3)	338 (78.6)	2541 (52.7)	2, 145.9 (<.001)
A levels or more	2402 (44.5)	30 (19.7)	92 (21.4)	2280 (47.3)	
Missing	419	n = 20	n = 49	n = 350	

df, degree(s) of freedom; RI, reading impairment.

Additional supplementary analyses were performed with additional adjustment for maternal education and socioeconomic status, with a slight resultant increase in the significance of the results but no overall change (Supplemental Table 5).

DISCUSSION

Specific learning disorder with reading impairment is a common developmental difficulty of childhood. Under DSM-V criteria, the cross-sectional prevalence of SRI in this study of 6000 children was 3% (n = 172), with MRI affecting another 8% (n = 479).

To our knowledge this is the first large study to assess such a broad spectrum of ophthalmic abnormalities in a population-based cohort of children. Data have been presented on several measures of vision and eye function that have previously been linked with poor reading: contrast sensitivity, strabismus and amblyopia, and binocular function (motor fusion, distance sensory fusion, convergence, accommodation), but no association between these and reading impairment has been found in this large sample. This finding was consistent with the majority of studies.[2,16,20,21,23] In contrast, 1 case–control study involving 55 Finnish children with dyslexia found an association with convergence insufficiency.[18] A review of the literature in 2013 found that poor perception of low contrast was associated with dyslexia.[24] These results were based on small school-based studies, with participants generally described as having "reading difficulties" rather than specifically dyslexia, and were not corroborated by the current study.

Depth Perception

Children with SRI were found to have slightly higher odds of stereoacuity worse than 60 seconds/arc. This finding is in keeping with published work,[14,15] but a number of studies, including a study of 86 children with dyslexia and controls and a descriptive review, have found contrasting results,[16,20–22] all of whom described no association between dyslexia and stereoacuity.

In all 3 groups the majority of children who had stereoacuity worse than 60 seconds/arc (n = 590) in fact had an only minimally worse score of 70 seconds/arc (typically developing 85%, n = 425; MRI 85%, n = 54; and SRI 89%, n = 25). There was a slightly higher percentage of children with stereoacuity of 400 or worse in the SRI group, compared with the MRI and typically developing groups, but the numbers were small: SRI, n = 2 (1.2% of all severely dyslexic patients, 7% of those with reduced stereoacuity); MRI, n = 2 (0.4% of total, 3% of those with reduced stereoacuity); without dyslexia, n = 13 (0.3% of total, 3% of those with reduced stereoacuity).

The threshold of 60 seconds selected in our study was based on Parks's[33] definition of grades of stereoscopic vision and the advice of experts in the field but was essentially arbitrary.[34]

TABLE 2 Ophthalmic Features of Children Who Entered Both the Vision and Reading Sessions and Had Sufficient Data Collected to Categorize by Presence and Severity of RI (total $n = 5822$)

	All in Reading and Vision Sessions Completing Each Individual Eye Test, *n* (%)	SRI, *n* (%)	MRI, *n* (%)	Typically Developing, *n* (%)	*df*, χ^2 Statistic (*P*)
Clinically significant strabismus					
Normal	5674 (97.9)	165 (96.5)	470 (98.3)	5039 (97.9)	2, 2.1 (.359)
Abnormal	123 (2.1)	6 (3.5)	8 (1.7)	109 (2.1)	
Missing	25	1	1	23	
Sensory fusion (near)					
Normal	4478 (88.5)	118 (83.7)	363 (86.6)	3997 (88.8)	2, 5.0 (.083)
Abnormal	584 (11.5)	23 (16.3)	56 (13.4)	505 (11.2)	
Missing	760	31	60	669	
Sensory fusion (distance)					
Normal	4672 (96.2)	133 (96.4)	384 (96.2)	4155 (96.2)	2, 0.0 (.992)
Abnormal	185 (3.8)	5 (3.6)	15 (3.8)	165 (3.8)	
Missing	965	34	80	851	
Motor fusion					
Normal	4896 (84.3)	147 (85.5)	418 (87.3)	4331 (84.0)	3, 5.2 (.271)
Abnormal	909 (15.7)	25 (14.5)	61 (12.7)	823 (16.0)	
Missing	29	0	0	29	
Stereoacuity					
60 seconds or better	5128 (89.7)	138 (83.1)	406 (86.6)	4584 (90.1)	2, 13.8 (.001)
Worse than 60 seconds	592 (10.3)	28 (16.9)	63 (13.4)	501 (9.9)	
Missing	102	6	10	86	
Mean estimated SE					
Hypermetropia	204 (3.5)	6 (3.5)	20 (4.2)	178 (3.5)	3, 3.7 (.508)[a]
Myopia	72 (1.2)	0 (0.0)	4 (0.8)	68 (1.3)	
Emmetropia	5522 (95.2)	165 (96.5)	451 (94.9)	4906 (95.2)	
Missing	24	1	4	19	
Amblyopia					
Normal	5602 (96.2)	165 (95.9)	455 (95.0)	4982 (96.3)	2, 2.26 (.324)
Abnormal	220 (3.2)	7 (4.1)	24 (5.0)	189 (3.7)	
Missing	0	0	0	0	
Mean convergence					
Top 95% of children (score of 6 or 7)	5415 (84.1)	161 (85.8)	446 (85.7)	4808 (83.9)	2, 0.8 (.665)
Abnormal (score of 8–40)	366 (5.1)	8 (3.6)	29 (4.8)	329 (5.2)	
Missing	51	3	4	44	
Accommodation					
Normal	5003 (86.8)	138 (83.6)	388 (82.0)	4477 (87.3)	2, 12.1 (.002)
Abnormal	761 (13.2)	27 (16.4)	85 (18.0)	649 (12.7)	
Missing	58	7	6	45	
Contrast (best eye)					
Normal	5351 (98.3)	150 (97.4)	437 (97.8)	4764 (98.4)	2, 1.5 (.349)[a]
Abnormal	94 (1.7)	4 (2.6)	10 (2.2)	80 (1.7)	
Missing	377	18	32	327	

df, degree(s) of freedom; RI, reading impairment.
[a] Fisher's exact test.

Adler et al[35] tested the value of a single Randot screening test and found that many children who exhibit abnormal stereoacuity on initial testing exhibit a normal result on retesting, and therefore a single assessment should be interpreted with caution. There may be reverse causation if children with SRI are less likely to guess when nearing the limit of their stereoacuity during testing than are children without SRI.

Furthermore, clinically significant reduced stereoacuity affected only 1% of children with SRI and 0.4% of children with MRI and, indeed, also affects 0.3% of nondyslexic children.

We used severe impairment, as defined by the DSM-V taxonomy, as our cutoff, whereas other studies have used different definitions of dyslexia, and our children with reading impairment were compared with the general cohort population rather than with controls selected from schools and clinics. Therefore, this study may be more likely to identify associations.

Fusing Ability

A total of 83% of children with SRI had normal sensory fusion, compared with 89% of children without reading impairment. Jainta and Kapoula[17] suggested that children with reading impairment place a larger demand on

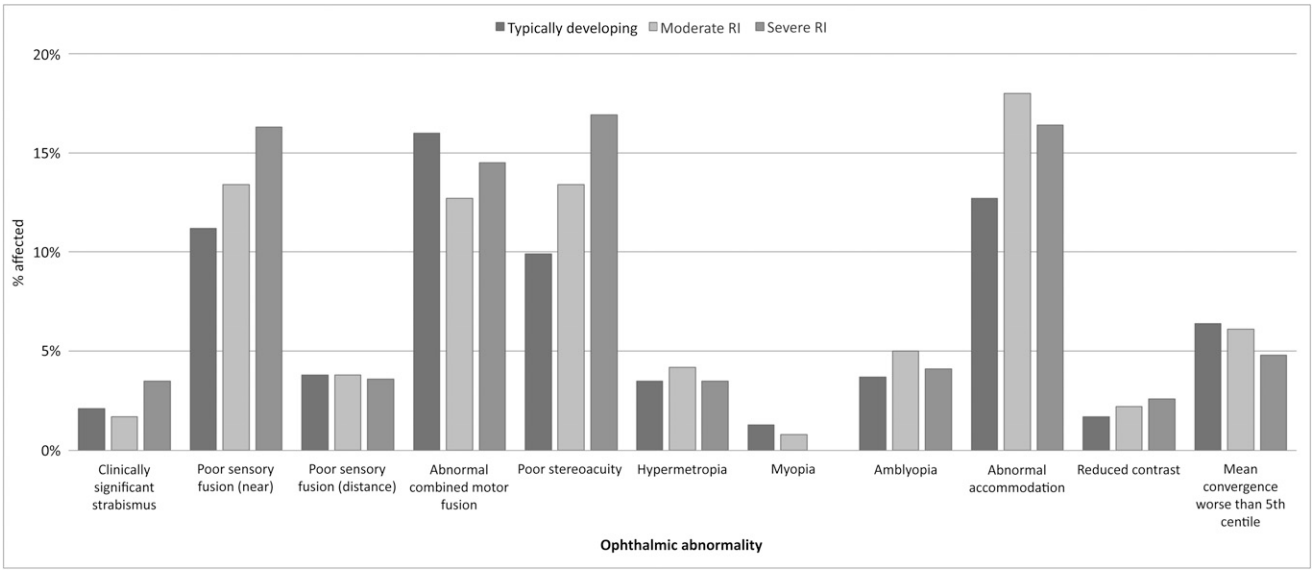

FIGURE 2
Percentage of ophthalmic abnormalities in children according to reading (RI) impairment category.

their sensory fusion processes. Although it carries some biological plausibility, it is not clear what the functional impact of reduced near sensory fusion would be in regard to reading ability, and this measure has not commonly been assessed in the literature; therefore, these results should be interpreted with caution and do not suggest that vision therapy for reading problems is warranted.

Additional analysis revealed that there was no propensity for a particular type of fusion abnormality. A total of 48% (n = 11) of children with SRI and abnormal sensory fusion suppressed the image from one or other eye (ie, saw 2 or 3 dots), and 52% (n = 12) were diplopic (ie, saw 5 dots). This distribution was similar to that seen in those with MRI (45%, n = 25 vs 55%, n = 31) and in typically developing children (41%, n = 208 vs 59%, n = 297). Those with poor sensory fusion at near were more likely to have strabismus (OR = 66.32; 95% CI, 44.52–98.82).

Strengths and Limitations

ALSPAC is one of the largest and most detailed population-based cohort studies of prospectively collected visual data and uses reproducible orthoptic tests. Previously literature reviews in general have been based on school-based studies involving small numbers of children and controls.[24] The ALSPAC study took place in a defined geographic area and was comparable with the United Kingdom as a whole in the 1991 census; however, the number of nonwhite families in ALSPAC was disproportionately small.[36]

Noncycloplegic refraction was used to define refractive error. The reliability of this method was evaluated against cycloplegic retinoscopy in children defined as having hyperopia in a nested validation study and was found to be 71% sensitive and 99% specific. However, this method may have resulted in an underestimate in the prevalence of hyperopia and therefore reduced our ability to

TABLE 3 Ophthalmic Abnormalities in Children With SRI Compared With Controls by Use of the Complete Case Data Set and Adjusted for Gender, Low Birth Weight, Preterm Birth, and Maternal Smoking

Ophthalmic Abnormality	Unadjusted Model OR (95% CI) (n of Children in Analysis)	P	Adjusted Model OR (95% CI) (n of Children in Analysis)	P
Clinically significant strabismus	1.71 (0.74–3.95) (5797)	.207	1.62 (0.69–3.81) (5392)	.269
Poor sensory fusion (near)	1.51 (0.96–2.39) (5062)	.074	1.63 (1.02–2.60) (4685)	.041
Poor sensory fusion (distance)	0.95 (0.38–2.34) (4857)	.908	0.92 (0.37–2.30) (4483)	.857
Abnormal motor fusion	0.89 (0.58–1.36) (5817)	.591	1.06 (0.69–1.65) (5399)	.782
Poor stereoacuity	1.80 (1.18–2.72) (5720)	.006	1.58 (1.01–2.47) (5324)	.044
Refractive error[a]	0.66 (0.32–1.34) (5798)	.252	0.83 (0.33–2.06) (5325)	.690
Amblyopia	1.08 (0.50–2.34) (5822)	.839	1.13 (0.52–2.46) (5416)	.766
Mean convergence	0.73 (0.36–1.50) (5781)	.389	0.76 (0.37–1.58) (5383)	.465
Accommodation	1.30 (0.85–1.97) (5764)	.225	1.37 (0.88–2.14) (5361)	.159
Contrast sensitivity (best eye)	1.54 (0.56–4.25) (5445)	.403	1.80 (0.64–5.08) (5056)	.266

[a] Hypermetropia and myopia.

quantify associations between hyperopia and reading impairment.[37]

A number of other ophthalmic-related variables are mentioned in the literature but not presented in this article, such as ocular motility problems (eg, poor saccades), because no objective data were collected on these problems, and visuocognitive impairments, which were not assessed until later in the ALSPAC study.

The current study uses cross-sectional data collected between 7 and 9 years of age, with vision testing being performed before reading tests. The data are observational so cannot indicate causality even if there are associations.

There was low sample attrition in adjusted analyses of only ∼9%. Given this small amount of missing data, we concluded the results were robust, and we did not undertake more formal analyses such as missing value imputation. Sample attrition associated with selective dropout by 7 to 9 years was potentially a more serious problem, although research has suggested that its impact on ORs may be minor.[38]

Despite the large sample size, there are 2 potential limitations. First, there was the possibility that the test statistics in logistic regression may deviate from the χ^2 distribution in a more major way for more rare predictors compared with more prevalent predictors. Hence, although power issues clearly favor our reported associations related to the 2 most prevalent predictors, it is possible that the 2 rarest predictors, strabismus and contrast sensitivity, also with ORs >1.5, may provide stronger evidence of an association than their reported *P* values of .269 and .266, respectively. However, use of Fisher's exact test to compare the unadjusted associations reported in Table 3 suggested that the *P* values may be biased toward the null but only to a minor extent (eg, .341 compared with .403). In contrast, sensory fusion (near), the most prevalent predictor, had better agreement (.081 compared with .074).

Second, the strength of evidence from the adjusted associations was weak. With only 2 out of 10 predictors showing associations at the 5% level, one can estimate a global *P* value across all predictors of .086, assuming predictors were independent. If predictors are correlated, the true global *P* value will gravitate toward the null.

General Discussion

The evidence base for currently practiced ophthalmic interventions in SRI is thin, despite their common use.[5,10,39] Process-focused therapies, including colored filters and treatments targeting visuomotor function, exist for dyslexia and are commonly offered privately by behavioral optometrists. Many of these interventions are based on the premise that a disorder in vision causes the disorder in reading and that, because of the plasticity of the brain, the vision difficulty can be improved with practice and consequently that the reading deficit will subsequently improve.

There is a lack of robust epidemiologic evidence to suggest that these therapies are effective in improving outcomes for those with dyslexia.[5] No national guidelines or recommendations exist for the use of ophthalmic interventions in dyslexia management. The best evidence is for intensive interventions involving instruction on phonics, word analysis, and reading fluency and comprehension.[40] Professional bodies recommend only routine vision checks and advise that children with SRI should have appropriate non–vision-based support.[41,42] However, many organizations and Web sites continue to recommend vision-based treatments.[43,44]

The data presented in this article may be helpful for families as reassurance that visual function is unlikely to be contributing to their child's reading problems and so they can pursue other options for supporting their child. The potential treatment options for dyslexia are varied and may be lifelong, so the financial implications are significant, as is the opportunity cost to children and families of pursuing interventions that are not evidence-based while perhaps neglecting other potentially beneficial interventions.

CONCLUSIONS

A large majority of children with SRI had normal vision as measured on a range of tests. No indication was found for routinely referring children diagnosed with SRI to an ophthalmologist or optometrist.

A minority of children with SRI had mildly reduced abilities in stereopsis testing and when fusing near targets, the significance of which is unclear, whereas the majority of children with SRI had normal function in all tests. Other evidence has not been found in support of ophthalmic therapies as a treatment of SRI or dyslexia. We suggest a detailed synthesis of the evidence and guidance from National Institute for Health and Care Excellence on managing specific learning difficulties including SRI, to optimize outcomes for affected children and their families without raising hopes and expectations regarding treatment outcomes.

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FIT LIKE A GLOVE: *As I write this, baseball's spring season is in full swing. Managers are looking at veterans and rookies, and games are being played in small stadiums across Arizona and Florida. Regardless of whether a veteran is guaranteed a roster spot, or a rookie is trying to break into the Major Leagues, all players face the same dilemma: how to break in a new baseball glove.*

As reported in The New York Times *(Sports: March 7, 2015), a baseball glove is a remarkably personal item. Each player has specific preferences for model, size, fit, and how to break the glove in so that if fits perfectly. Gloves worn by outfielders are generally quite long – better to snag fly balls. Gloves worn by infielders are generally shorter, making it easier to get the ball out for a quick toss. Catchers use heavily padded mitts, while pitchers wear gloves that have a tight web so that the batters cannot see how they are holding the ball. However, each player has his own way of getting the glove ready for use. Some use leather softeners or literally beat the glove with a large object. Others microwave the glove to soften it and then shape it with a ball or some other object. Others catch hundreds of balls thrown from a pitching machine.*

I have not purchased a new glove in a long time, but I do remember the terrific smell and the stiffness of the leather. I always wanted the flex just right so that I could scoop the ball easily while playing shortstop. My own preference was to put a baseball at the base of the web and then tuck the glove under the mattress. I do not know if any Major League players use this technique, but it worked for me in Little League.

Noted by WVR, MD

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