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ORIGINAL ARTICLE

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Retrospective chart review of spectacle prescription prevalence in adults with learning disabilities in Scotland

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Abstract

Background: Evidence suggests that people with learning disabilities are less likely to have an up-to-date eye examination as sight loss is characteristically underdiagnosed in people with complex needs.

Method: A retrospective study of records from 576 Service Users of RNIB UK Vision, learning disability and Complex Needs Services was carried out.

Results: The record review found a higher prevalence of spectacle prescription in a learning disability (LD) population in agreement with findings from other LD studies. There was a higher prevalence of severe myopia in people with LD compared with a general adult population.

Conclusion: This study found a higher prevalence of spectacle prescription in people with learning disabilities compared to a general adult population, which has implications for people with learning disabilities to ensure that they have access to eye care and regularly attended eye tests. It also has implications for healthcare professionals working with people with complex needs to ensure they have access to eye care.

KEYWORDS
complex needs, learning disability, spectacle prescription, visual impairment

1 | INTRODUCTION

Visual impairment data reveal a wide range of prevalence estimates for vision problems but all suggest that these conditions are more prevalent amongst individuals with learning disabilities (LD) compared with the general population (Carvill, 2001; Warburg, 2001). The most common visual impairment problem is refractive error which is the consequence of the eye's inability to focus images resulting in blurred vision, which can be corrected with a spectacle prescription. Refractive error affects just over half of European adults with high incidence of myopia in young adults (Williams et al., 2015). This meta-analysis of 15 European studies found a prevalence rate of myopia (nearsightedness) at 30.6%, high myopia 2.7% and hyperopia (far-sightedness) 25.2%. Whilst the prevalence rate of the general population is known, a prevalence rate in people with learning disability is yet to be definitively established. Warburg's, 2001 review cited 28 studies with a wide range of age ranges, learning disability and prevalence rates of visual impairment (1.5%–40%). It found a high incidence of all types of refractive error; myopia, hyperopia and astigmatism were common, compounded with age and severity of learning disability (Warburg, 2001). Prevalence estimates suggest that six out of every 10 people with learning disabilities has a visual impairment (Emerson & Robertson, 2011); estimates were based on findings from a Dutch population with learning disability and extrapolated to the UK.

Adults with learning disabilities are more likely to have sight problems, and this is exacerbated by severity of learning disability and increasing age (Carvill, 2001; Krinsky-McHale, Jenkins, Zigman, & Silverman, 2012; Starling, Willis, Dracup, Burton, & Pratt, 2006; Warburg, 2001). Learning disability conditions associated with eye problems include the following: Down's syndrome, Usher's Syndrome, Fragile X, Rubella, Hydrocephalus and Cerebral Palsy (Kielinen et al., 2004; Rogers & Newhart-Larson, 1989; van Splunder, Stilma, Bernsen, & Evenhuis, 2004, 2006). Yet, people with learning disabilities are less likely to have had an up-to-date eye examination as sight loss is characteristically underdiagnosed in people with complex needs (Evenhuis, Theunissen, Denkers, Verschuure, & Kemme, 2001; van Splunder et al., 2006; Warburg, 2001; Woodhouse, Griffiths, & Gedling, 2000).

Undetected and undiagnosed sight loss has an impact on a person's quality of life. Frequently behavioural difficulties such as difficulty with motor coordination or problems navigating spaces with intense light sources can be attributed to a person's learning disability (Desrochers, Oshlag, & Kennelly, 2014; Starling et al., 2006).

In Scotland, there are 23,186 adults with learning disabilities who are known to local authorities (SCLD, 2017), with just under half living independently (not in contact with services). Starling et al., (2006) suggests that people with learning disabilities who live in supported accommodation (in contact with services) are less likely to have an eye test as sensory impairment goes undetected. It is important that people with learning disabilities and complex needs access eye care Legislation.gov.uk (2010).

This study focuses on a population with learning disability in Scotland and compares it with the findings from Woodhouse et al., (2000) who found a high incidence of refractive errors in a community-based learning disability population. Woodhouse et al., (2000) found high prevalence of uncorrected refractive errors, 41% long sighted and 56% were short sighted, and compared the results with a non-LD adult population (an all-male adult National Service recruits). The results reported a significantly higher prevalence of refractive error in the LD population. The impetus for this study, therefore, was to ascertain whether there was a similar prevalence rate of refractive error in this LD population, and whether the incidence rate was higher than in the general population; in this instance, the comparative sources were Williams et al., (2015) meta-analyses. This was chosen over Woodhouse's comparison group as it was more representative of the general population, presenting both sexes in a European wide meta-analysis.

1.1 | Rationale & research questions

This retrospective chart review aimed to ascertain whether the incidence of spectacle prescription in a Scottish LD population was similar to findings from comparative studies, taking into account that other studies reported refractive error and this study was dependent on spectacle prescription as provided by primary optometrists. The findings from two notable studies; one LD population, Woodhouse et al., (2000), and the control group, a general adult population Williams et al., (2015) provided the data to answer the following questions:

1. What is the prevalence of spectacle prescriptions in people with a learning disability in Scotland?
2. Is this comparable to known LD population?
3. Is the prevalence rate of spectacle prescriptions in learning disability population comparable to the general adult population?

2 | METHODS

2.1 | Study design & setting & sample

This was a retrospective chart review of Service Users (SU) who were referred to Royal National Institute of Blind People (RNIB) by the National Health Service (NHS) Health Boards in Scotland between 2006 and 2015. RNIB worked in partnership with Health Boards throughout Scotland including the following: Ayrshire and Arran, Borders, Fife, Forth Valley, Greater Glasgow and Clyde, Lanarkshire, Lothian, Perth and Tayside.

Service users were referred to the RNIB by the Healthboards; healthcare and social care workers would refer service users if they had no up-to-date record of a vision assessment in their health record or if there were concerns that SU may have an eye problem, not all people with LD were referred to RNIB. Service users/carers consented to take part in the vision assessment and to share their results of their vision assessments with RNIB. The data gathered were stored on a password-protected computer, and paper files were stored in locked filing cabinet in RNIB offices in accordance with RNIB's ethical safeguarding guidelines and data protection legislation.

The Service Users were identified as having a Learning Disability by the Health Boards and were accepted as having "a significant impairment of intelligence and social functioning acquired before adulthood" (DoH, 1998). Service users received a basic vision assessment from RNIB staff who carried out observations and noted down service users' mobility and ability in doing basic tasks. The observation results provided background information for the Optometrist from NHS GOS (General Ophthalmic Services) who conducted the primary eye exam. The Service User then received a printed Vision Report following the Vision Assessment process, which included details of the spectacle prescription issued by Optometrists. The RNIB retained a copy and the data was collated in MS Excel Document from 2006 to 2015.

The information extracted from the review of eligible records included the following; age, gender, results of optometric exam including the spectacle prescription data, consisting of Sphere, Cylinder and Axis, which are the measurements that determine the strength of spectacles needed to correct a person's vision. Sphere is the amount of lens power measured in dioptres (dioptre is a unit of refractive power, which is equal to the focal length [in metres] of a given lens) to correct near sightedness or farsightedness. Cylinder is lens power needed to correct for astigmatism. The Axis is the number on a spectacle prescription which tells the optician in which direction they must position any cylindrical power in your lenses required for people with astigmatism.

2.2 | Assessment of visual impairment

Refractive error is the dioptric power of the ametropia of the eye (Millodot, 2004). Ametropia is the refractive state of an eye where the image of an object at infinity is not formed on the retina causing

TABLE 1 Prevalence of spherical equivalent (SE) in current study

SE errors for both eyes n = 1,152	SE for right eyes		SE for left eyes			
	N	%	*N*	%	SE for both eyes	%
High myopia ≥−6 D	70	12.2	74	12.9	144	12.5
Moderate myopia ≤−3 D to >−6 D	47	8.2	40	6.9	87	7.5
Low myopia ≤−0.75 D to >−3 D	115	20	113	19.6	228	19.7
High hypermetropia ≥+3 D	86	14.9	86	14.9	172	14.9
All myopia	272	47.2	266	46.2	538	46.7
All hypermetropia	333	57.8	341	59.2	674	58.5
All astigmatism	402	69.8	414	71.9	816	71.7

blurred sight. Prescribed glasses correct for the anomaly at the set distance from the surface of the cornea, with the ametropias being astigmatism, hyperopia (far sightedness) and myopia (near sightedness). It is the refractive error that determines the spectacle or contact lens prescription for a person. The spectacle prescription data consisting of Sphere, Cylinder and Axis was converted into two different formats, the "Spherical Equivalent" (SE) and "Least Ametropic Meridian" (LAM); this was done to allow for comparison with the two studies involved in this analysis (Williams et al., 2015; Woodhouse et al., 2000)

The "Spherical Equivalent" is the set of two numbers, one value for each eye that gives an estimate of the eyes' refractive error. Spherical Equivalent is equal to the algebraic sum of the value of the sphere and half the cylindrical value (Millodot, 2004); for example, the spectacle prescription of −2.00 / +3.00 × 90 would have a Spherical Equivalent of −0.50 D that is (−2.00 + 1.50). Conversion into Spherical Equivalent allows comparison with author Williams et al. (2015) cited in this report.

Least Ametropic Meridian (LAM) is another method of assessing the refractive error of the eye described by Sorsby, Sheridan, Leary, and Benjamin (1960) as either the mean spherical value of the two orthogonal power meridians, where the two meridians did not differ by more than 0.5 D or the lesser meridian, that is nearest to zero, in eyes with astigmatism in excess of 0.5 D Sorsby et al. (1960). For example, the spectacle prescription −2.00 / +3.00 × 90 would have two orthogonal power meridians of −2.00 D and + 1.00 D, and since astigmatism is in excess of 0.50 D, the least ametropic meridian is + 1.00 D. Where the power meridians equalled each other in magnitude, for example −0.75 / +1.50 × 180, would be power meridians of −0.75 D and + 0.75 D, then 0 D was chosen as the "LAM." Conversion into Least Ametropic Meridian allows comparison with the findings of Woodhouse et al., (2000).

2.3 | Data analysis

The data were analysed using SPSS v 22; descriptive statistics are presented. Chi-square tests were used as this study analyses the frequencies of categorical data. Chi-square tests the association, in this instance, between refractive error in LD populations and comparative control general population.

3 | RESULTS

Between 2006 and 2016, there were 576 service users of which 526 had a non-specific learning disability, 27 had Down's syndrome, 16 had ASD, five had cerebral palsy and two had brain damage. The age range was from 15 years to 99 years old, averaging 44.2 years old. There were 307 (53.3%) females and 268 (46.5%) males, and one person's sex was not recorded.

3.1 | Spherical equivalence

Spherical equivalent is a set of two numbers, one value for each eye that gives an estimate or the eye's refractive error. Table 1 details the spherical equivalent in both eyes for this study.

Table 1 highlights the number of people with high hypermetropia; severe far-sightedness, ≥+3 D, 14.9% left eye and 14.9% in the right eye. There was a higher incidence of high myopia; severe near-sightedness ≤−6 D with 12.9% in the left eye and 12.2% in the right eye, compared with high hypermetropia, which was 3.8%.

3.2 | Comparison of prevalence of spherical equivalent

The conversion into Spherical equivalent format allows comparison with other studies which present frequency data on spectacle prescriptions. Specifically, Williams et al., 2015 used refractive data from 15 population-based cohorts and cross-sectional studies of the European Eye Epidemiology (E3) Consortium.

Comparison of reported frequency data (Table 2) reveals that there is relatively close agreement between this study and Williams et al., (2001) for moderate myopia (7.5% & 7.13%) and low myopia (19.7% & 16.32%). However, there was a greater difference in high myopia frequencies; this study found 12.5% compared with 2.35% in Williams et al., 2001 study. There were also discernible differences

TABLE 2 Comparison of prevalence of spherical equivalent

Spherical errors	Williams et al., 2015 (*n* = 61,476)	%	Butchart & Colahan (present study)	%
High myopia ≥−6 D	1,445	2.35	144	12.5
Moderate myopia ≤−3 D to >−6D	4,383	7.13	87	7.5
Low myopia ≤−0.75 D to >−3 D	10,034	16.32	228	19.7
High hypermetropia ≥+3 D	4,494	7.31	172	14.9
All myopia	15,845	25.8	538	46.7
All hypermetropia	21,201	34.5	674	58.5
All astigmatism	15,496	25.2	816	71.7

in high hypermetropia 14.9% compared with 7.31% and all astigmatism with 71.7% compared with 25.2%.

A chi-square test was performed to assess whether there was a significant difference in the prevalence of spectacle prescription in people with LD and non-LD adult population. The results suggest there was a highly significant difference between the two studies which means that the people with LD were more likely to have spectacle prescriptions than the general adult population (X^2 [6] = 348.35, $p < 0.001$). The LD population was more likely to have severe myopia (12.5%) than the general population (2.35%), $p = 0.05$. The LD population was also more likely to have astigmatism (71.7%) than the general population (25.2), $p = 0.05$.

3.3 | Comparison of prevalence of least ametropic meridian

The prevalence rates of refractive error in our sample were comparable with Woodhouse et al., (2000) who found a high incidence of refractive error in a LD population. There was no significant difference between the two groups which would suggest population similarity (X^2 [6] = 5.296, $p > 0.05$) Table 3 illustrates that there were slightly higher prevalence of high myopia (over −6.00 D) at 8.7% compared with 6.8% found by Woodhouse et al.

A chi-square test was undertaken to ascertain whether there was a significant difference in the incidence of refractive error in a comparable LD population (Woodhouse et al., 2000). The results suggest there was no significant difference between the two studies (X^2 [6] = 5.296, $p > 0.05$), confirming the findings from this study are comparable to other LD studies which suggest people with LD are more likely to have spectacle prescriptions.

4 | DISCUSSION

A report by World Health Organisation (WHO) suggests that the most common eye problems are refractive errors which affect 43% of the population worldwide (Hashemi et al., 2018), which is frequently overlooked and undetected in people with learning disabilities (Emerson & Robertson, 2011; van Splunder et al., 2006; Warburg, 2001). Estimates of visual impairment in LD populations vary from 1.5% to 40% (Warburg, 2001) despite eye problems being specifically associated with known LD conditions.

TABLE 3 Comparison of prevalence of least ametropic meridian

Spherical errors	Woodhouse et al., (2000)[a]	%	Butchart & Colahan (present study)	%
Emmetropia normal range (−1.00 to 0.90)	49	33.3	458	39.8
Low hypermetropia (+1.00 to + 2.90)	42	28.6	266	23
Moderate hypermetropia (+3.00 to + 5.90)	19	12.9	112	9.7
High hypermetropia (+6.00 and over)	2	1.4	25	2.2
Low myopia (−1.10 to −3.00)	16	10.9	120	10.4
Moderate myopia (−3.10 to −6.00)	9	6.1	72	6.2
High myopia (over −6.00)	10	6.8	99	8.7
Astigmatic errors				
No significant cylinder (0 to 1.00)	94	63.9	753	65.3
Low cylinder (1.25 to 3.00)	46	31.3	297	25.8
High cylinder (over 3.00)	7	4.8	102	8.9

[a]Woodhouse used data from the right eye, and this study included data from both eyes.

This study adds to this evidence base by reporting the incidence of refractive error in LD population in Scotland. The evidence highlights the number of people with high hypermetropia (severe long-sightedness) 14.9% left eye and 14.9% in the right eye. There was a higher incidence of high myopia (severe short-sightedness) with 12.5% in the left eye and 12.2% in the right eye.

Comparing this study's findings with outcomes from previous research, it demonstrated good agreement with the findings of Woodhouse et al. (2000). The closest agreement found was the range moderate myopia (−3.10 D–6.00 D) with a prevalence of 6.2% for this study and 6.1% for Woodhouse et al. The greatest disagreement found was the range low hypermetropia (+1.00 to +2.90) with a prevalence of 23% for this study and 28.6% for Woodhouse et al., 2000. This study found a higher incidence of high hypermetropia (+6.00 and over) with 2.2% for this study compared with 1.2% and higher incidence of high myopia (over −6.00) with 8.7% for this study compared with 6.8%. The findings from this chart review confirm the premise that refractive error is prevalent in LD population. A direct comparison with Williams et al., (2015) showed a higher prevalence of spectacle prescription in the LD population than would be expected in an adult population. The greatest difference found was for all astigmatism with a prevalence of 71.7% for this study and 25.2% for Williams et al., (2015). The LD population was more likely to have myopia (moderate to high) than the general population.

This study's main weakness is in the retrospective nature of a chart review which is reliant on a convenience sample of available records; therefore, dropout rates and non-completion of eye exams were not recorded. The results, therefore, are not generalizable as the sample bias cannot be measured.

The findings from this study confirm that refractive error is more likely in people with learning disabilities. The higher incidence of spectacle prescription in this population should highlight the need for eye health care amongst this vulnerable group and ensure all health and social care professionals are working towards providing equality of access to eye care for people with learning disabilities and complex needs.

In conclusion, this study reports a higher incidence of spectacle prescription in adults with learning disabilities in accordance with findings from other LD populations. People with LD were more likely to have high or moderate myopia (≤−3 D–≥6 D) in comparison with the general population; they were also more likely to have astigmatism. Considering the high incidence of refractive error in this group, it is, therefore, important that people with learning disabilities and complex needs have access to eye care and support services are aware of the possibility of refractive error in their service users.

5 | LIMITATIONS

This study is limited by the retrospective nature of a chart review. In this study, spectacle prescription is being used and not ocular refraction, which would require knowledge of the back vertex distance (BVD), which is the distance between the back surface of a corrective lens and the front of the cornea for each service user at the time of the optometric visit.

This study did not distinguish the level of learning disability as noted in the comparative study by Woodhouse. This review did not report on specific eye conditions that may affect spectacle prescription, for example keratoconus and cataract surgery.

There are no data on previous spectacle prescription or testing, therefore, no assessment on the gap in service provision could be assessed.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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