UK National Screening Committee

Childhood vision screening

28 June 2019

Aim

1. To ask the UK National Screening Committee (UK NSC) to make a recommendation, based on the evidence presented in this document, whether or not childhood vision screening meets the UK NSC criteria for a systematic population screening programme.

Current recommendation

2. Currently, the UK NSC recommends vision screening for children aged 4 to 5 years in an orthoptic led screening service, with testing using a crowded logMAR acuity chart.

   'This is a long-standing recommendation. A review in 2012 concluded that: …:

   I. Amblyopia can increase the risk of vision impairment or blindness due to subsequent loss of vision in an individual's non-amblyopic eye.
   II. Screening at ages under 4 years may increase the proportion of children with normal vision who, because of their developmental status, 'fail' vision screening necessitating further examination to accurately assess their vision and rule out amblyopia, thus increasing opportunity and economic costs. Screening later than the age of 4 to 5 years is likely to result in poorer outcomes in children with moderate and severe amblyopia, and is unlikely to confer benefit in terms of increased reliability of testing.

   However, the review also highlighted that there remained limited evidence on the clinical effectiveness of screening at ages 4 to 5 years old or that the overall benefits of childhood vision screening at this age would outweigh any harms. There was also an absence of evidence on the long-term adverse impact of amblyopia in the absence or presence of childhood treatment and on the cost effectiveness of screening.

Evidence Summary

3. The 2019 evidence summary was undertaken by Ameenat L Solebo, Jugnoo S Rahi, in accordance with the triennial review process.

4. The UK NSC assesses the viability of all national screening programmes every three years. The starting point for these reviews is a triage review, which is a high-level review that scans the literature to identify 'red flags' suggesting that further exploration of programme cessation may be necessary. Triage reviews have a surveillance function and are not intended as comprehensive reviews of the programme. Therefore, the first question evaluated by this review was in relation to the possible harms experienced by individuals after participating in a childhood vision screening programme for vision defects. No red flags were identified

5. The second part of this review aimed to address important evidence gaps found by the previous UK NSC evidence review for the childhood screening programme. The following three key questions were evaluated:

    I. What is the long-term adverse impact of amblyopia with and without treatment? (criterion 1)
    II. What is the clinical effectiveness of vision screening in children aged 4 to 5 years? (criterion 11)
    III. What is the cost-effectiveness of vision screening in children aged 4 to 5 years? (criterion 14)

6. Based on the synthesis of evidence against the UK NSC criteria this updated analysis of the evidence for vision defects screening in children did not identify sufficient evidence to support a change in the previous recommendation.

7. Evaluation of the gaps in the evidence:

    I. This evidence summary found that although amblyopia can impact reading speed in individuals with amblyopia because it has an influence on the type of eye movements which are used to track words across a page when reading, reading comprehension is unchanged, and the 'real-life' consequences of this remain unclear. Also, the evidence suggesting that there was no impact of amblyopia on educational outcomes and self-esteem; however, this evidence was limited to one study. This evidence summary did not identify any evidence of the impact of amblyopia on the patient perceived disutility, general health, quality of life, adverse health events, or specific occupational restrictions. No studies were identified looking explicitly at untreated amblyopia. Thus, this evidence summary is unable to comment on the impact of untreated amblyopia. **Criterion 1: Not met**

II. There was an absence of direct evidence on the clinical effectiveness of screening. There is weak but consistent evidence suggesting that populations which undergo childhood vision screening have statistically lower prevalence of amblyopia in adulthood than historical controls. However, causal relationships between the two are not proven. Furthermore, there was no evidence on the effect of screening on quality of life, socioeconomic outcomes, behavioural and functional outcomes, or patient-perceived disutility of amblyopia or of bilaterally poor vision due to loss of vision in the better eye of an amblyopic individual later in life. **Criterion 11: Not met**

III. There was no evidence on the cost effectiveness of vision screening. **Criterion 14: Not met**

Consultation

8. A three month consultation ending on the 28 June 2019 was hosted on the UK NSC website. Direct emails were sent to 16 stakeholder organisations. **Annex A**

   Six sets of comments were received from:

   - The College of Optometrists
   - Dr Alison Bruce Director of Vision Research (Born in Bradford)
   - J Margaret Woodhouse School of Optometry & Vision Sciences Cardiff University
   - SeeAbility
   - Plusoptix GmbH
   - British & Irish Orthoptic Society

   (See **Annex B** for comments)

9. General comments raised by the consultees.

   - Some stakeholders found that the aim of this document was not very clear. **Response**: The aim of this document was, as indicated above (section 4), firstly to scan the literature to identify papers discussing harms associated with the current screening programme which suggest that further exploration of programme cessation may be necessary. Secondly, to assess gaps in the evidence raised by the previous UK NSC review. Some changes have been made to the text of the review to clarify this. Also, the review focused on amblyopia as this was the focus of the previews UK NSC review. Although amblyopia is the main target disorder for the

screening programme, any other disorder, such as functionally significant refractive error (error which is sufficiently severe to negatively impact visual development) would be detected through the current UK NSC programme which detects all-cause reduced acuity because of the detection of the resultant amblyopia (https://www.gov.uk/government/publications/child-vision-screening/service-specification).

- Some stakeholders commented on the fact that some articles published in the British and Irish Orthoptic Journal (BIOJ)were not included in the review.
  Response: the BIOJ although peer reviewed journal is not published online and it is necessary to perform a manual search to obtain such evidence. According to the UK NSC process (https://www.gov.uk/government/publications/uk-nsc-evidence-review-process/uk-nsc-evidence-review-process) for this rapid review, the searching was limited to bibliographic databases and hand searching of the reference sections of eligible studies. Hand searching of literature available outside of the accepted bibliographic database of life sciences and biomedical peer reviewed, published papers was not undertaken.
- Some stakeholders noted that the review did not include papers from a research programme nested within a UK birth cohort (Born in Bradford) that linked vision screening results with epidemiological data giving information on visual acuity levels at the point of screening, risk factors for failing vision screening, prevalence of strabismus, failure to attend rates in a UK multi-ethnic population and impact on early literacy.
  Response: the research included in the review was selected based on its direct relevance in addressing a pre-defined set of questions. These questions did not include visual acuity at the point of screening, prevalence of strabismus, or risk factors for screening test outcome. Additionally, the Born in Bradford vision screening test did not follow recommendations in the UK NSC guidance. Children underwent formal orthoptic testing (a 'cover test') as part of their assessment. This is an expert clinical assessment which is not part of the UK NSC recommendation for screening at 4-5 years by testing of acuity alone.
- A stakeholder noted that some gaps in the evidence indicated in the 'Evidence uncertainties' section of the document in relation to 'The real-life educational consequences of amblyopia' might be fulfilled by the inclusion of a "real-life"

longitudinal observational study of Born in Bradford birth cohort children (reference provided below).

Response: the referenced study (Effect of adherence to spectacle wear on early developing literacy: A longitudinal study based in a large multi-ethnic city, Bradford, UK) identified the importance of intervention for children with refractive error with regards to early literacy outcomes. The study did not examine the real-life long term impact of amblyopia. Investigators did not report the frequency of refractive amblyopia (that is, how many children required early intervention to prevent irreversible visual deficit). Should reports become available from the Born in Bradford cohort comparing long term outcomes for those children with and without refractive or other amblyopia (treated or untreated), then these will be of interest to the questions posed in this review.

- Some consultees raised issues relating to the phraseology and content of the review, interpretation of individual papers and overall analysis. Consultees also suggested that some papers had been missed.

  Response: These suggestions were considered by the reviewer and alterations were made to the evidence review where appropriate. Where studies were published within the timeframe of the literature search the reviewer and advisers were asked to consider them for inclusion. None of the papers suggested met the inclusion criteria and were not included in the review. Papers published after the review search dates were not included in the review.

10. None of the stakeholders disagreed with conclusions of part one of the review, and no 'red flags' were raised following the consultation process. In relation to part one of this document:

    - One stakeholder noted that most of the studies aimed at measuring the impact of amblyopia do not clearly state whether the participants have been treated for amblyopia, therefore the outcome cannot be clearly assigned to the condition or the treatment of it. It also pointed out that to determining whether amblyopia has associated harm, the panel should consider whether there are also harms associated to the treatment of the condition.

      Response: We agree that this lack in the information provided by the studies makes measuring the impact of amblyopia difficult. Triage reviews have a surveillance function and are not intended as comprehensive reviews of the programme.

Therefore, aim of the question for part one of this review, was to evaluate the possible harms experienced by individuals after participating in a childhood vision screening programme and did not look directly at harms associated with the treatment of for amblyopia.

- One stakeholder suggested that the recommendation should be rephrased to reflect a competence-based service rather than one based on professional boundaries.

  Response: this recommendation was agreed by the UK NSC in 2013 and it is reflected in the screening pathway developed following the implementation of such recommendation.

Recommendation

1. The conclusion of this review was to ask the Committee is asked to approve the following recommendation:
   No changes to the current screening programme for vision defects in children aged 4 to 5 years should be implemented

   Following the discussion at the Committee it was highlighted the need for good clinical management and research in the non-screening areas as a potential alternative to screening. It was suggested that comparative research may be possible as substantial areas of the country did not offer screening. In these areas it may be possible to ensure that a high quality service is implemented to manage clinically presenting cases and that outcome data from the two approaches could be collected and compared. If this approach was taken there may be less pressure on Local Authorities to implement screening on the basis of poor evidence.

   The final recommendation agreed by the Committee was the following:
   'The UK NSC recommended that there should be no change to the current guidance on screening for vision defects in children aged 4- 5 years and that this should remain under review'

UK National Screening Committee

Criteria (only include criteria included in the review)	Met/Not Met
Section 1 - Criteria for appraising the viability, effectiveness and appropriateness of a screening programme	
The Condition	
1. The condition should be an important health problem as judged by its frequency and/or severity. The epidemiology, incidence, prevalence and natural history of the condition should be understood, including development from latent to declared disease and/or there should be robust evidence about the association between the risk or disease marker and serious or treatable disease.	**Not Met**
The screening programme	
11. There should be evidence from high quality randomised controlled trials that the screening programme is effective in reducing mortality or morbidity. Where screening is aimed solely at providing information to allow the person being screened to make an "informed choice" (such as Down's syndrome or cystic fibrosis carrier screening), there must be evidence from high quality trials that the test accurately measures risk. The information that is provided about the test and its outcome must be of value and readily understood by the individual being screened	**Not Met**
13. The benefit gained by individuals from the screening programme should outweigh any harms for example from overdiagnosis, overtreatment, false positives, false reassurance, uncertain findings and complications	**Not Met**
14. The opportunity cost of the screening programme (including testing, diagnosis and treatment, administration, training and quality assurance) should be economically balanced in relation to expenditure	**Not Met**

	on medical care as a whole (value for money). Assessment against this criteria should have regard to evidence from cost benefit and/or cost effectiveness analyses and have regard to the effective use of available resource	

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Annex A

List of organisations contacted:

1. British and Irish Orthoptic Society
2. British Association of Behavioural Optometrists
3. College of Optometrists
4. Communication Trust
5. Faculty of Public Health
6. Institute of Child Health
7. Optical Confederation
8. Royal College of General Practitioners
9. Royal College of Ophthalmologists
10. Royal College of Physicians
11. Royal College of Physicians and Surgeons of Glasgow
12. Royal College of Physicians of Edinburgh
13. Royal National Institute of Blind People (RNIB)
14. UK Vision Strategy
15. Vision Checks
16. Vision2020UK

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Annex B — Consultation comments

Name:	Olivier Denève	**Email address:**	xxxx xxxx
Organisation (if appropriate):	The College of Optometrists		
Role:	**Head of Policy and Public Affairs**		

Do you consent to your name being published on the UK NSC website alongside your response?

Yes ☒ **No** ☐

Section and / or page number	Text or issue to which comments relate	Comment *Please use a new row for each comment and add extra rows as required.*
General	General	The evidence review is incomplete. The NSC defines visual defects as including "amblyopia, refractive error and strabismus"[1] but the review only focuses on amblyopia. 1. https://legacyscreening.phe.org.uk/vision-child
Executive summary/Purpose of the review page 6	"The purpose of this document is to review the evidence on childhood screening for reduced vision".	It is not clear what the evidence review set out to evaluate. The opening line of the executive summary implies it will evaluate the evidence for "screening for reduced vision". The NSC policy mentions screening for "vision defects" which is defined as "including amblyopia, refractive error and strabismus" If the NSC's objective with the review was to evaluate "the evidence on childhood screening for reduced vision" where "vision defects include amblyopia, refractive error and strabismus" then it is incomplete.
Executive summary/Recommendation under review page 7	"Currently, the UK NSC recommends	A policy based upon competencies rather than professional boundaries would be supported by the evidence, reflect developments in the general NHS and public health workforce and potentially improve programme delivery without presenting any clear risk to the quality or

	vision screening for children aged 4 to 5 years in an orthoptic led screening service"	efficiency of screening. Profession-based service descriptors are inflexible and out of step with developments across the healthcare where competence-based service definitions are now the norm. We believe a competency-based policy would be easier to implement across the UK without any negative impact on outcomes. We recommend changing the policy to "all children should be screened for reduced vision between 4 and 5 years of age, with testing undertaken and led by competent professionals".
Part Two Criterion 1 □ long-term adverse impact of amblyopia page 28	"Although amblyopia is the main target disorder for the screening programme, any other disorder, such as functionally significant refractive error (error which is sufficiently severe to negatively impact visual development) would be detected through the current UK NSC programme which detects all-cause	The decision to exclude causes of reduced vision other than amblyopia results from the assumption that refractive error alone cannot be considered a visual impairment or sufficiently severe a cause of reduced vision to merit intervention unless it is associated with amblyopia. Assuming that refractive error cannot be considered a source of reduced vision unless it is associated with amblyopia is at odds with internationally accepted definitions of visual impairment. The World Health Organisation amended its definition of visual impairment from a classification based upon "best corrected visual acuity" (meaning how clearly one can see wearing corrective lenses) to one using "presenting visual acuity" (how well someone can see given how they currently live, be that with or without corrective lenses). The WHO case for changing the definition noted that "Many recent studies have shown that the use of "best corrected" vision overlooks a large proportion of persons with visual impairment, including blindness, due to uncorrected refractive error, a common occurrence in many parts of the world. Uncorrected refractive error is now considered to be a major cause of visual impairment and estimations are under way to calculate the loss in terms of DALYs (disability-adjusted life years) resulting from this cause. The correction of refractive error is a cost effective intervention and is one of the priorities under the disease control component of the Global Initiative for the Elimination of Avoidable Blindness (VISION 2020, the Right to Sight)"[2].

	reduced acuity because of the detection of the resultant amblyopia."	2. https://www.who.int/blindness/Change%20the%20Definition%20of%20Blindness.pdf Under this definition, refractive error can be a cause of visual impairment if it is not diagnosed or corrected. Further more, the 2005 study by Robaei et al found that uncorrected refractive error was the biggest cause of reduced vision within a large population-based sample of children with amblyopia the next most common cause[3]. That a significant proportion of children who fail screening are likely to need corrective lenses due to refractive error is demonstrated by other studies[4,5]. 3. Robaei,D et al (2005) Visual Acuity and the Causes of Visual Loss in a Population-Based Sample of 6-Year-Old Australian Children, Ophthalmology, Volume 112, Issue 7, July 2005, Pages 1275-1282, https://doi.org/10.1016/j.ophtha.2005.01.052 4. Donaldson LA, Karas MP, Charles AE, Adams GG, Paediatric community vision screening with combined optometric and orthoptic care: a 64-month review. Ophthalmic and Physiological Optics, 22: 26-31. **https://doi.org/10.1046/j.1475-1313.2002.00001.x** 5. Newman DK, Hitchcock A, McCarthy H, *et al* Preschool vision screening: outcome of children referred to the hospital eye service. British Journal of Ophthalmology 1996;80:1077-1082.

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Name:	xxxx xxxx	**Email address:**	xxxx xxxx
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Role:	**Senior lecturer and Optometrist**		

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Yes ☐ **No** ☐

Section and / or page number	**Text or issue to which comments relate**	**Comment** *Please use a new row for each comment and add extra rows as required.*
10	Evidence not yet available	What is missing from most studies purporting to measure the impact of amblyopia is whether the participants have been *treated* for amblyopia. If they have, when it is not clear whether the reported outcomes, be it eye movements, low self-esteem etc, is due to the amblyopia per se, or to the occlusion therapy. In addition to determining whether amblyopia has associated harm, the panel should consider whether the treatment has associated harm

UK National Screening Committee

Name:	Donna O'Brien	**Email address:**	xxxx xxxx
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Yes ☒ **No** ☐

Section and / or page number	Text or issue to which comments relate	Comment *Please use a new row for each comment and add extra rows as required.*
Page 13	UK NSC set up a Vision Screening Advisory Group to produce materials to support the consistent implementation of high quality vision screening services, including screening and diagnosis pathways and quality standards. This included screening conducted in an orthoptic led service and use of the logMAR chart as a screening test, with a threshold of 0.2 logMAR.	SeeAbility contributed to the consultation from the Vision Screening Advisory Group and we were pleased that Public Health England's materials referenced the need for an alternative pathway in special schools (referencing the agreed clinical framework published by RCOphth, British and Irish Orthoptic Society, ABDO, College of Optometrists, and LOCSU, with SeeAbility in 2016. This can be found at www.rcophth.ac.uk/wp-content/uploads/2016/07/Framework-for-Proposed-Special-Schools-Service-Final-ABDO-BIOS-College-of-Optometrists-LOCSU-RcOphth-and-SeeAbility-2.pdf This is now being pursued by NHS England so that all children in all special schools, at all ages receive an eye examination and the spectacle dispensing services they need as recommended by the Clinical Framework. By pursuing and funding a universal primary ophthalmic services programme in special schools, it is hoped to

		overcome some of the identified risks of vision screening alone (see Donaldson et al 2019) below. SeeAbility would welcome national advice on pathways following screening. We also propose provision of information to all parents following screening to avoid incorrect assumptions that vision screening is a full eye and vision assessment/sight test. The screening review acknowledges that vision screening programmes are for the purpose of detecting amblyopia and there is evidence that measuring visual acuity does not reliably detect refractive errors. See O'Donoghue L, Rudnicka AR, McClelland JF, Logan NS, Saunders KJ (2012) Visual Acuity Measures Do Not Reliably Detect Childhood Refractive Error - an Epidemiological Study. PLoS ONE 7(3): e34441\0. https://doi.org/10.1371/journal.pone.0034441
Page 25	This review did not identify any investigations of other harms from childhood vision screening such as over treatment, false reassurance, a social complication or a reason for disinvestment.	We recognise this is a high level evidence review with studies only published up to 14 August 2018 included. Unfortunately then our study of 11 March 2019 (Donaldson, L. A., Karas, M., O'Brien, D., & Woodhouse, J. M. (2019). Findings from an opt-in eye examination service in English special schools. Is vision screening effective for this population? *PloS one*, *14*(3), e0212733) is outside the review period however it is important to ensure the NSC is aware of its publication for forthcoming.

		It confirms what is known from published studies in Wales Woodhouse, J. M., Davies, N., McAvinchey, A., & Ryan, B. (2014). Ocular and visual status among children in special schools in Wales: the burden of unrecognised visual impairment. *Archives of Disease in Childhood*, 99(6), 500-504 and Scotland Das, M., Spowart, K., Crossley, S., & Dutton, G. N. (2010). Evidence that children with special needs all require visual assessment. *Archives of Disease in Childhood,* 95, 888-892 of the high ocular and visual burden amongst children with learning disabilities. In our study, having examined the eyes of 949 pupils in special schools in England we also found clear evidence of unmet need: almost half of the children reported no previous eye care, 119 children had an undiagnosed visual problem, and 122 children were prescribed glasses for the first time. More importantly for this review, our results also show screening is not appropriate for those with more complex needs. In the SeeAbility service, for children starting reception year (at age 4–5) or nursery, a joint optometric/orthoptic assessment was carried out when possible, with visual acuity and binocular vision status being measured by an orthoptist. 156 pupils fell into this age group (4.00 to 5.97 years) but only 10 pupils were able to use a LogMAR crowded acuity type test (Kays Pictures LogMAR or Keeler LogMAR) and only one (0.6%) was able to pass the test using the recommended Keeler letter test. This was either because of their existing vision problems or because they just wouldn't be able to

		complete the test. For example, despite the availability of a wide range of visual acuity tests, a reliable measurement of visual acuity using established methods was only possible for 60.5% of children. Most currently available tests have been developed based on normal cognitive development and so are not optimal for this population which indicates a need for development of further tests specific to the learning-disabled child. As our findings show that children on the autistic spectrum were less likely to achieve a reliable acuity measurement, tests targeted to this group are clearly needed.
Page 28	Many disorders causing significant visual impairment, such as cataract, cerebral visual impairment, and retinopathy of prematurity would be detected before age 4 to 5 years through the Newborn and Infant Physical Examination programme(1) or through surveillance of high risk populations.(16) Solebo AL, Rahi J. Epidemiology, aetiology and management of visual impairment in children. Archives of disease in childhood. 2014;99(4):375-9	We have a particular comment on the information highlighted in yellow. Unfortunately there is no current UK programme that allows for ophthalmological surveillance of high risk populations of children with neurodevelopmental impairments, despite recommendations (Hall and Elliman (2008). Health for all children: Revised fourth edition. Oxford, Oxford University Press and Clarke M (2012). Ophthalmic Services for Children. The Royal College of Ophthalmologists: Ophthalmic Services Guidance). This is why many children with more severe or profound learning disabilities or autism – a known high risk group - can fall through the gap as evidenced by Pilling RF and Outhwaite L, Are all children with visual impairment known to the eye clinic? Br J Ophthalmol. 2017 Apr;101(4):472-474. doi: 10.1136/bjophthalmol-2016-308534. Epub 2016 Jul 27. This was published within the review period.

		The aim of the study was to determine the unmet need and undiagnosed visual problems of children attending primary special schools in Bradford, England. Those who were not under the care of the hospital eye service were identified. Assessments of visual function and refractive error were undertaken on site at the schools by an experienced orthoptist and/or paediatric ophthalmologist. A total of 157 children were identified as eligible for the study, with a mean age of 7.8 years (range 4-12 years). Of these, 33% of children were found to have visual impairment, as defined by WHO and six children were eligible for severe sight impairment certification. It highlights the poor uptake of hospital eye care for children identified with significant visual needs and suggests the importance of providing in-school assessment and support, including refractive correction. In addition to Donaldson et al (2019) above, this provides evidence as to why NHS England is right to pursue a universal primary ophthalmic services programme in England's special schools.

UK National Screening Committee

Name:	Mr. Christian Schmidt	**Email address:**	xxxx xxxx
Organisation (if appropriate):	Plusoptix GmbH (www.plusoptix.com) Plusoptix GmbH is a German based manufacturer of medical devices. Customers include ophthalmic researchers, eye care professionals and primary healthcare providers. With subsidiaries in the US and Switzerland and a network of independent distributors, instruments are available in 60+ countries around the world. Due to its international exposure and the company's mission to eradicate Amblyopia, Plusoptix GmbH has an overview of vision screening programmes in many countries, including but not limited to: Austria, China, Germany, Italy, Russia, Switzerland, UK, USA etc. Having observed UK NSC recommendations for vision screening for some time now, we feel obliged to provide feedback in the context of this consultation. This feedback is provided with the best intention, i.e. to eradicate Amblyopia by contributing to the optimization of vision screening programmes. Please be aware that English is not our mother tongue. Therefore we are limited in our abilities to express comments in a sophisticated way. For the sake of avoiding misunderstandings a straightforward wording has been chosen. This is by no means a sign of disrespect.		
Role:	**Managing Director**		

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Yes, I consent

Section and / or page number	**Text or issue to which comments relate**	**Comment** *Please use a new row for each comment and add extra rows as required.*
Page 7: Focus of the review and	Four questions are presented as "focus" of this review. And the first of these four questions is: "1. What harms do individuals experience after participating in a childhood vision screening programme for vision defects? (criterion 13)"	NHS has published a set of 20 numbered criteria that any UK screening programme should to meet, see: https://www.gov.uk/government/publications/evidence-review-criteria-national-screening-programmes/criteria-for-appraising-the-viability-effectiveness-and-appropriateness-of-a-screening-programme

Page 15: Table 1	For time reasons we have refrained from a detailed analysis of the other three questions.	The authors are making reference to these criteria by their numbering, but they rephrase NHS criteria. NHS criteria number 13 reads: “The benefit gained by individuals from the screening programme should outweigh any harms, for example from overdiagnosis, overtreatment, false positives, false reassurance, uncertain findings and complications.” This definition of criteria 13 is provided by the authors in table 1, page 15, actually. So the authors are aware of the original wording, but they limited the scope of the original criteria to one single aspect, i.e. false positive referrals with the potential harm from over diagnosis and overtreatment. It’s important to note that NHS is concerned about “false reassurance”, in other words false negatives, as well as uncertain findings and complications. These aspects of NHS criteria number 13 are ignored by the authors, deliberately.
Page 8: Findings and gaps in the evidence of this review	“There is currently an absence of specific evidence on the harms of childhood vision screening as practiced within current UK NSC recommendations.”	Consultation comments to previous review in 2013 include a feedback from Dr. Alison Bruce at the Bradford Teaching Hospitals NHS Foundation Trust: “The literature search does not include the British and Irish Orthoptic Journal which although peer reviewed is not published online. Over the past 5 years there have been a number of papers published in BIOJ on vision screening relating to the review which could inform the debate. I would suggest that a manual search of this journal should be included in literature review.” This comment was not considered by the authors. BIOJ was not reviewed in their evidence research in 2019. If the reason for not

		reviewing evidence provided in BIOJ is a lack of online publishing, it should be stated that evidence may be available in BIOJ, but because of review design the decision was taken to ignore it. If there are other reasons that keep the authors from reviewing BIOJ these reasons need to be outlined in the review. Not having reviewed BIOJ the authors were able to identify nothing but three papers that relate to criteria 13. Two of which are based on studies performed abroad. In other words, the "surveillance function" of this review regarding criteria 13 is performed for the most part by looking at other countries screening programmes.
Page 80: Table 5. Quality assessment of included studies using the Critical Appraisal Skills Programme checklist for observational studies	All 3 included papers are analysed one by one, using a set of 13 questions. Question number 2 reads: "Did the authors use an appropriate method to answer their question?" The answer to this question for all 3 included papers is the same: "High risk of bias" and "Retrospective cohort with no follow up of those who test negative on screening" Question number 9 reads: "Was the follow up of subjects complete enough?" The answer to this question for all 3 included papers is the same: "High risk of bias" and "no follow up of those who test negative on screening"	All 3 papers included in the review share a "High risk of bias" in methodology as well as in the scope of follow-up exams. This implies that no conclusions should be drawn from these papers.

Page 24: Methodological quality of included studies	"For all of the 3 included papers, a key area of bias within the study methodology was selective reporting. No study examined outcomes for children who had 'passed' the vision screening test but only reported outcomes for those who had 'failed'."	The authors acknowledge that there is no evidence whatsoever regarding the prevalence and consequences of false negatives.
Page 9: Recommendations on screening	"This updated analysis of the evidence for vision defects screening in children against the UK NSC criteria did not identify sufficient evidence to support a change in the previous recommendation. The main reason for this are a failure to identify any harms from childhood vision screening."	Considering the above it seems that "[…] a failure to identify any harms from childhood vision screening." was achieved by re-defining the scope of NHS criteria 13, ignoring any information that was published in BIOJ and accepting three highly biased papers for review, instead.

UK National Screening Committee

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Role:	Vision Screening Clinical Advisory Group		

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Yes X **No** ☐

Section and / or page number	**Text or issue to which comments relate**	**Comment** *Please use a new row for each comment and add extra rows as required.*
P5	"The most common conditions which cause amblyopia are squint and long/short sightedness."	Short sight (myopia) is not prevalent in young children in the UK and does not commonly lead to amblyopia. Astigmatism, however, does, we suggest the plain English summary be re-worded to "squint and /or focussing errors including long-sight and astigmatism"
P5	"There may be a high number of children told they have poor vision when they do not."	The term "poor vision" is generally avoided in any screening communication with a parent/carer. When a child is referred from screening parents are fully informed that their child hasn't passed their test; "The screening test suggests your child has reduced vision in one of/both of their eyes…. Further tests are required to confirm your child's results." https://www.gov.uk/government/publications/child-vision-screening
P6	"The most common conditions pre-disposing to amblyopia…"	We suggest the text is changed to include astigmatism
P11	"The majority of children with significantly reduced vision affecting both eyes are diagnosed early in childhood due to the concerns of carers / care-givers, or in the	The referenced paper relates to the detection of severe visual impairment and blindness (SVI / BL) and is based on the number of children registered as visually impaired by the consultant ophthalmologist within the hospital eye service (HES). The referenced

	context of the routine universal Newborn and Infant physical Examinations."	paper includes children with additional disabilities who have a higher risk of visual impairment and does not address the number of children that have significantly reduced vision with no additional pathology or co-existing condition who do not enter the HES. The term "significantly reduced vision" therefore requires to be defined. Orthoptic-led screening programs have reported identifying children with bilateral reduction of visual acuity (VA) at age 4-5 years. References: O'Colmain U,Low L, Gilmour C, et al. Vision screening in children: a retrospective study of social and demographic factors with regards to visual outcomes. Br J Ophthalmol 2016;100:1109–1113 Bruce A, Santorelli G, Bradbury J, et al. Prevalence of, and Risk Factors for, Presenting Visual Impairment: Findings from a vision screening programme based on UK NSC guidance in a multi-ethnic population. Eye (Lond). 2018 Oct; 32(10): 1599–1607. doi: 10.1038/s41433-018-0146-8
P12	The description of occlusion treatment states, "Occlusion is performed with eye-patches…."	The description provided gives no indication of the number of hours an eye patch is worn on a daily basis. A lay person may assume it is worn all day and we suggest the review considers referring to the length of time a patch is usually worn. Occlusion is not restricted to the wearing of eye-patches and atropine occlusion may be used as a first line of treatment. References: Stewart CE, Moseley MJ, Stephens DA, Fielder AR. Treatment dose-response in amblyopia therapy: the Monitored Occlusion Treatment of Amblyopia Study (MOTAS). Invest Ophthalmol Vis Sci. 2004 Sep;45(9):3048-54. Glaser SR, Matazinski AM, Sclar DM, Sala NA, Vroman CM, Tanner CE, et al. A randomized trial of atropine vs patching for treatment of moderate amblyopia

		in children. Arch Ophthalmol. 2002;120(3):268–78. doi: 10.1001/archopht.120.3.268.
P24	"Of those who attended their diagnostic examination, the proportion of false positives found across the studies was 38/260 (15%, 95% CI 11% to 19%) in the UK study,(9) 214/556 (39%, 95% CI 35% to 43%) in the New Zealand study,(8) and 12/36 (33%, 95% CI 20 to 50%) in the North American study.(7)"	A UK study published in the BIOJ, presents PPV and false positive data from an orthoptic-delivered vision screening programme. Reference: Masqud, M. and Medforth, S., 2015. Vision screening – referral to discharge. Outcomes from a routine vision screening programme. *British and Irish Orthoptic Journal*; 2015 12, pp.20–25 http://doi.org/10.22599/bioj.91
P25	"..may not be directly generalisable to the current UK programme, which uses a screening test of reduced vision."	This is true for England and Wales but not in NHS Scotland where an orthoptic delivered vision screening programme covering all Scottish Health Boards is established. Within the Scottish programme the orthoptists perform additional tests of eye movement and binocular function. Children referred go on to have further diagnostic tests; cycloplegic refraction, fundus and media examination. Reference: "Guidance to support implementation in Scotland of Royal College of Paediatrics and Child Health recommendations on child health screening and surveillance." https://www.gov.scot/publications/health-children-4-guidance-implementation-scotland-2005/pages/5/
P28	"There is no evidence of benefit with intervention for refractive errors of mild myopia (short-sightedness) and hypermetropia (long-sightedness) at age 4 to 5 years. These refractive disorders are associated with good distance vision in both eyes (14) and thus will not be detected through a screening programme for which the test is distance acuity."	Even mild myopia will cause a reduction in distance vision. Again the review makes no reference to astigmatism which is far commoner than myopia in children aged 4 – 5 years. With regard to the referenced paper (14) we suggest that the findings have been taken out of context as the authors' state: *"This emphasises the importance of screening in this young age group for anisometropia and refractive error, including astigmatism." and "These associations in a population based sample further support*

		refractive vision screening assessment in young children in order to prevent amblyopia" Clinically vision screening programmes identify reduced vision associated with significant refractive errors from testing distance visual acuity. References: Afsari S, Rose KA, Gole GA*, et al* Prevalence of anisometropia and its association with refractive error and amblyopia in preschool children *Br J Ophthalmol* 2013;97:1095-1099. Bruce A, Santorelli G, Bradbury J, *et al* Prevalence of, and Risk Factors for, Presenting Visual Impairment: Findings from a vision screening programme based on UK NSC guidance in a multi-ethnic population. Eye (Lond). 2018 Oct; 32(10): 1599–1607. doi: 10.1038/s41433-018-0146-8
P28	"…hypermetropia will naturally improve with increasing age as the eyes grow in size."	This is not always the case, particularly in anisometropic children, where the asymmetry may increase with age. Reference: Deng L and Gwiazda J,E. Anisometropia in Children from Infancy to 15 Years Invest Ophthalmol Vis Sci. 2012 Jun; 53(7): 3782–3787.doi:10.1167/iovs.11-8727
P28	"Although amblyopia is the main target disorder for the screening programme, any other disorder, such as **functionally significant refractive error** (error which is sufficiently severe to negatively impact visual development) would be detected through the current UK NSC programme which detects all-cause reduced acuity because of the detection of the resultant amblyopia."	The phrase "functionally significant refractive error" is important. Refractive errors affect each child very differently. If a child's vision is persistently reduced there is some evidence that functionally significant refractive errors may have an impact on education and even correction of low levels of refractive error may be appropriate. References: Kulp MT, Ciner E, Maguire M, et al. Uncorrected hyperopia and

		preschool early literacy: results of the Vision in Preschoolers-Hyperopia in Preschoolers (VIP-HIP) study. *Ophthalmology* 2016;123:681–9. Bruce A, Kelly B, Chambers B et al. The effect of adherence to spectacle wear on early developing literacy: a longitudinal study based in large multi-ethnic city Bradford, UK. BMJ Open 2018; 8: e021277
P39-40	"Morbidity would include reduced vision in both or one eyes and the associated negative consequences…" (p39) "There were also no studies on the effectiveness of screening on visual acuity or impairments, quality of life, socioeconomic outcomes, behavioural and functional outcomes, patient perceived disutility and general health." (p40)	Suggested References: Bruce A, Kelly B, Chambers B *et al.* The effect of adherence to spectacle wear on early developing literacy: a longitudinal study based in large multi-ethnic city Bradford, UK. *BMJ* Open 2018; 8: e021277 Kulp MT, Ciner E, Maguire M, et al. Uncorrected hyperopia and preschool early literacy: results of the Vision in Preschoolers-Hyperopia in Preschoolers (VIP-HIP) study. Ophthalmology 2016;123:681–9.

UK National Screening Committee

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Do you consent to your name being published on the UK NSC website alongside your response?

Yes x **No ☐**

Section and / or page number	Text or issue to which comments relate	Comment *Please use a new row for each comment and add extra rows as required.*
P8 Part One	"Data came from studies which are not directly applicable to recommended practice in the UK."	The review did not consider any of the published papers from a research programme nested within a UK birth cohort (Born in Bradford) that linked vision screening results with epidemiological data. Papers from this programme of research have been published reporting visual acuity (VA) levels at the point of screening,[1] risk factors for failing vision screening,[1] prevalence of strabismus,[2] failure to attend rates in a UK multi-ethnic population[1] and impact on early literacy,[3] yet none of this evidence has been considered within the review.
P 10 Evidence uncertainties	This review identified evidence gaps including "The real-life educational… consequences of amblyopia."	The review did not consider the results of a "real-life" longitudinal observational study of Born in Bradford birth cohort children.[3] The children were followed up after vision screening at age 4-5 years with repeat measures of visual acuity, and literacy over a three year period reported. Although this was not a RCT the study observed the real-life effect of failing to adhere to glasses wear recommended post vision screening. The outcomes (VA and literacy) of a comparative group of children who passed vision screening were also reported. The VA of children who adhered to glasses wear improved at twice the rate of children who failed to adhere and by the end of the three year period the VA's of adherent children had improved to the level of the

		comparison children. The VA's of the children who did not adhere were significantly reduced in comparison to the adherent and the comparison groups. The analysis of educational outcomes after taking into account potential confounding factors demonstrated an association between VA and literacy scores.
P11.	"The majority of children with significantly reduced vision affecting both eyes are diagnosed early in childhood due to concerns of carers or in the context of the routine universal Newborn and Infant Physical Examinations."	The term "significantly reduced vision" is ambiguous in this context; the reviewers are referring to a visual impairment such as partial sight or blindness. Children with bilateral amblyopia can have significantly reduced levels of VA in both eyes and as stated in the review (page 11) are not aware that they have reduced vision and will not complain. In Bradford we reported 4% of children at age 4-5 years had a presenting visual impairment (defined as VA of >0.3logMAR in the better eye with spectacles if worn) at the point of vision screening.[1] Parents and teachers do not notice a problem and therefore a child is at risk of entering school with an undetected reduction in VA.
P24.	"No study examined outcomes for children who had passed the vision screening test but only reported outcomes for those who had failed."	The review did not consider a paper reporting VA and literacy outcomes measured over a three year period in children participating in the BiB cohort study.[3] The paper reports VA and literacy outcomes in children who 'failed' vision screening and also reports the outcomes of a comparison group of children who 'passed'.
P25	"All of the included studies used pass/fail criteria which differed from those currently recommended by the UK NSC for UK childhood vision screening."	The review did not consider the findings from the Bradford vision screening programme based on UK NSC guidance in a multi-ethnic population.[1] The paper reports visual acuity levels and associated factors e.g. Socio-economics, ethnicity, birth weight and additionally reports fail to attend and the false positive rates of those children who did attend.
P27-28	The review concentrates on the impact of unilateral amblyopia and suggests there is little benefit of screening and treatment for other conditions; in	Astigmatism is not referred to in the review. Astigmatism reduces the level of visual acuity at both near and distance and if left uncorrected could result in bilateral ametropia. A high prevalence of astigmatism has

	particular it states “There is no evidence of benefit with intervention for refractive errors of mild myopia and hypermetropia at age 4-5 years. These refractive disorders are associated with good distance vision in both eyes and thus will not be detected through a screening programme for which the test is distance acuity.”	been reported in south Asian populations in the UK.[1,4] 6% of the UK population is of South Asian origin; this is the fastest growing ethnic group in the UK.[5] In Bradford the children of south Asian origin have been reported to have higher prevalence of astigmatism compared to the white British children who had a higher prevalence of hypermetropia.[1] The presence of hypermetropia in the white British children was also associated with the presence of esotropia,[2] a factor associated with unilateral amblyopia.
P28	Eligibility for inclusion in the review	It is disappointing that none of the publications nested in the Born in Bradford (BiB) birth cohort were considered by the review. All the studies were based on data from the vision screening of 17000 UK children over a 3 year period with linkage to detailed epidemiological data in a sub-group of 5000 BiB children and mothers. This data was further enhanced by longitudinal measures of visual acuity and literacy. The results from the research programme along with further qualitative interviews with parents[6] and eye care professionals[7] has led to the design and implementation of a school based trial to support children’s glasses wear, ‘Glasses in Classes’. This trial is currently in set up and has been adopted onto the NIHR portfolio. https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/glasses-in-classes/

References:

1. Bruce A, Santorelli G, Bradbury J, Barrett BT, Wright J, Bloj M and Sheldon TA. Prevalence of, and Risk Factors for, Presenting Visual Impairment: Findings from a vision screening programme based on UK NSC guidance in a multi-ethnic population. *Eye (Lond)*. 2018 Oct; 32(10): 1599–1607. doi: 10.1038/s41433-018-0146-8

2. Bruce A, Santorelli G. Prevalence and Risk Factors of Strabismus in a UK Multi-ethnic Birth Cohort. *Strabismus* 2016;24(4):153-60.

3. Bruce A, Kelly B, Chambers B, Bradbury J, Barrett BT, Bloj M and Sheldon TA. Effect of adherence to spectacle wear on early developing literacy: A longitudinal study based in a large multi-ethnic city, Bradford, UK. *BMJ Open* 2018;8:e021277. doi:10.1136/bmjopen-2017-021277

4. Fuller JR, Baxter LA, Harun S, et al. Astigmatism in Bangladeshi and white school entrants in East London: A prospective comparative study. *Eye* 1995;9(6):794-96.

5. Office for National Statistics. Census: Aggregate data (England and Wales) [computer file]. UK Data Service Census Support. Downloaded from: http://infuse.ukdataservice.ac.uk. This information is licensed under the terms of the Open Government Licence [http://www.nationalarchives.gov.uk/doc/open-government-licence/version/2], 2011.

6. Bruce A, Sanders T and Sheldon TA. A qualitative study investigating the perceptions of parents of children who failed vision screening at the age of 4-5 years. *BMJ* Paediatrics *Open* 2018

7. Cassetti, V., Sanders, T. and Bruce, A., 2019. Challenges of Eye Health Care in Children and Strategies to Improve Treatment Uptake: A Qualitative Study from the Perspective of Eye Care Professionals in the UK. *British and Irish Orthoptic Journal*, 15(1), pp.96–104. DOI: http://doi.org/10.22599/bioj.133


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