Vision Screening Programmes: Collaborative work for developing evidence-based vision screening protocols.

The ability to see clearly both at distance and at near is important in allowing children and adolescents to develop to their full potential in life. The WHO's first world report on vision published in October 2019 (WHO, 2019) showed that more than 1 billion people in the world have vision problems that are preventable, with the majority being related to uncorrected refractive errors. As stated in the UN resolution 75/310, the provision of eye care services for everyone is essential for achieving the Sustainable Development Goals 1, 2, 3, 4, 8, 10 and 11. While there is a general acceptance that children's vision screening is important, uncertainty remains about the best approach to take to develop and run a successful programme. This is evidenced by the different methods of vision screening employed across the world. This inconsistency is not unexpected when one considers that screening protocols are influenced by factors of resources/cost, the skills of the screener, time constraints and prevalence of eye and vision problems in the target population. There is a consensus that examining children at about 4–5 years of age is useful at detecting problems such as reduced visual acuity, amblyopia, strabismus, and some refractive errors. However, the ability to detect these problems accurately will be influenced by the approach taken. For example, measuring distance visual acuity in each eye is likely to pick up most children with amblyopia, myopia and higher levels of astigmatism but is much less likely to pick up strabismus and hyperopia. The addition of a distance and near cover test would allow strabismus to be picked up, but hyperopia may still prove elusive. Additional tests would be required to detect hyperopia, but there is a lack of knowledge to what combination of tests might be most useful. Potential options include near VA testing, cycloplegic refraction or measuring distance vision through positive (e.g. +2.00D) or negative spherical lens power (e.g. -4.00D). All these possibilities bring additional levels of complexity and resource that could impact on the viability of a screening programme. For example, the addition of a near test may help detect additional hyperopia but the availability of print sizes that are close to VA threshold continue to make this a difficult option.

Current knowledge would also suggest that it is not enough to just have one screening at about 4–5 years of age, as eyes and vision continue to develop throughout childhood, into adolescence, when myopia often first appears, and beyond. Furthermore, hyperopia may impose an increasing problem during later school years when the level of near work required to be able to do school- and homework puts an increasing demand on sustained comfortable vision. This suggests that there may not necessarily be one gold standard approach to vision screening that should be undertaken across all age groups. However, it would be useful if the decisions taken when developing future vision screening programmes could be evidence-based.

In this special topic of the Scandinavian Journal of Optometry and Vision Science we hope to address some of the issues outlined above and would welcome contributions that will help vision screeners during the development stage of screening protocols. One important question would be to assess the trade off in sensitivity and specificity that can occur when additional tests are included in a screening protocol. To this end we are hoping to develop a screening protocol paper that would be available to researchers and project students around the world to generate data. This protocol will help to address questions surrounding the most effective methods of picking up hyperopia in different age groups. Is cycloplegia essential or do techniques such as near vision assessment and plus blur have a role, at least in some age groups?

Another important consideration in any screening programme is the issue of cost, and vision screening programmes that give full details of cost are limited. This is unsurprising when one considers the drivers of costs such as the availability of drugs, equipment, screening personnel and time are all likely to vary between countries. To this extent, knowledge from other research fields may become important. The use of technology is likely to continue to drive some screening approaches. For example, deep learning has shown reasonably good performance at predicting refractive error from fundus images (Varadarajan et al, 2018) and a novel vision screener instrument has reported good success at detecting strabismus and amblyopia in a school age population (Bosque et al., 2021). The ubiquitous mobile phone may also play an important role in measuring visual performance as technology develops. Equally simple solutions may be the most effective. Modifying visual acuity chart design to allow easier scoring (WHO, 2018) may be a quick and cost-effective solution and the role of questionnaires in vision screening has yet to be fully examined.

The above discussion highlights the scope of the topic that needs to be examined further in the field of children's vision screening. We hope that by making vision screening a special topic in *SJOVS* we can encourage collaboration between groups of researchers, clinicians, and students and help in the development of evidence-based solutions to the current problems facing vision screening across the world. Of course, identifying eye and vision problems represents only the first stage in a screening process. It is important to mention that any screening programme requires several follow up steps to be successful. Good access to further examination for screening is required and affordable spectacles need to be provided. A mechanism of follow up is also important as, once dispensed, the spectacles need to be worn appropriately. Failure to address any of these issues will limit the benefits of a screening programme and innovative methods of addressing these issues are encouraged.

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