Letters to the Editor

Vision in Preschoolers Study

Dear Editor:

I have anxiously awaited the initial publication from the Vision in Preschoolers Study (VIPS). I was not disappointed by the recent excellent report, though many details probably have been trimmed in the interest of journal space limitations.

We have used similar combinations of sensory and objective tests in the Alaska Blind Child Discovery Project. The proportion of young children not testable and with inconclusive interpretations varies greatly with the level of experience of the screening personnel. Over half of Alaskan children live in urban environments similar to the VIPS communities; however, many others live in remote villages, and for them, confirmatory examinations can be very expensive ($1000). For this reason, we have attempted to reduce false-positive overreferrals with highly specific photoscreen interpretation. (In rural and remote screening, the cost benefit increases with more specific tests.)

One of the occult disorders most likely to cause amblyopia is hyperopic anisometropia, a condition that is represented by two thirds of the patients recruited into the amblyopia treatment studies. From Table 3 in the VIPS, severe anisometropia was reported as a mixture of hyperopia, astigmatism, and myopia, or 1.7% of children tested. Group 2 anisometropic patients were defined as not severe, did not have type or magnitude of refractive error listed, but occupied 2.5% of children. Consistent with published reporting guidelines, I would like to know the sensitivities to detect threshold hyperopic anisometropia 1.50 diopters from the various VIPS modalities at the comparable specificity level of 94%.

I applaud the authors on this first phase of an important study.

ROBERT W. ARNOLD, MD
Anchorage, Alaska

References


Author reply

Dear Editor:

We thank Dr Arnold for his favorable comments on our article summarizing phase I of the Vision in Preschoolers (VIP) Study. Because of the high cost of overreferrals in his screening program, Dr Arnold is interested in the sensitivity of the screening tests when specificity is relatively high, at 0.94. Among a number of established amblyogenic conditions, he has selected hyperopic anisometropia of 1.5 diopters (D) for special consideration. Inspection of the VIP data shows that the 4 tests that were best at detecting children with any targeted condition and children with a group 1 (very important to detect and treat early) condition were also the best at detecting hyperopic anisometropia of 1.5 D. Although noncycloplegic retinoscopy, Lea Symbols (Precision Vision, Inc., La Salle, IL) visual acuity, the Retinomax Autorefractor (Nikon, Inc., Melville, NY), and the SureSight Vision Screener (Welch Allyn, Inc., Skaneateles Falls, NY) ranked above the other screening tests in the VIP dataset, there were only approximately 30 children per year with this particular amblyogenic factor, and the 95% confidence interval for the sensitivity of each test is approximately ±0.18. Thus, the low precision of the estimates of sensitivity for detecting children with this one condition precludes conclusions about the superiority of one screening test over another.

Indeed, as Dr Arnold surmised, many details were trimmed to keep the article a reasonable length. The VIP Study Group is preparing additional articles based on the phase I data to characterize more fully the attributes of the screening tests that were studied.

THE VISION IN PRESCHOOLERS STUDY GROUP

Reference


Dear Editor:

The Vision in Preschoolers Study provides new insights into the effectiveness of screening methods when compared under optimal conditions (same child for multiple tests, administered by trained professional staff). A central finding of the study is the relative merit of determining the refractive status of the child (hyperopia, myopia, astigmatism) as a screening strategy for the detection of other conditions (amblyopia, strabismus) that require timely intervention. The present study used cycloplegic retinoscopy by multiple examiners as the gold standard examination (GSE).

Accurate and precise determination of refractive error is vital in such studies. For this reason, most recent studies use cycloplegic autorefraction for the GSE. Handheld autorefractors have been shown effective in preschool-age children. Studies of manual retinoscopy have shown that cycloplegic retinoscopy is less reproducible than cycloplegic autorefration or noncycloplegic retinoscopy. The 95% limits of agreement between cycloplegic autorefration were ±0.32 diopters (D) and, for manual cycloplegic retinoscopy, ±0.95 D, almost 3 times worse.
Inaccurate or imprecise determination of refractive status will result in misclassification of some children with significant refractive error as having less than the threshold amount (and thus erroneously classified as having the amblyogenic condition), or those truly having the amblyogenic condition being erroneously classified as normal. The potential exists for other more accurate or more precise screening instruments to classify correctly individual subjects, yet be marked down with reference to the GSE. With misclassification, both sensitivity and specificity can be influenced, but the amount and direction deviation from the truth occurs will be difficult to predict.

Although the designers of the study took care to insure that examiners did not perform both screening and GSE retinoscopic examinations on a given child, training may have resulted in similar misclassification of refractive status on both GSE and noncycloplegic refraction, and may explain the somewhat surprising finding that noncycloplegic refraction, having poorer repeatability, marginally outperformed the autorefractors evaluated in this study.

Further evidence of misclassification of refractive error is present in this study by some inconsistencies with previous reports of sensitivity and specificity for the reported methods. Other studies will have different proportions of children with significant refractive error and amblyopia, and may not be directly comparable. One study that directly compared screening methods in children having a high prevalence of astigmatism used cycloplegic autorefraction for the GSE, and found some differences worthy of comment. The MTI Photoscreener (Medical Technologies, Inc., Riviera Beach, FL) was found to have 57% to 58% sensitivity and 87% to 89% specificity when the photos were interpreted by the Vanderbilt Reading Center. Measurement of visual acuity using the Lea Figures (Precision Vision, Inc., La Salle, IL), when performed using the Early Treatment Diabetic Retinopathy Study protocol, was essentially unable to achieve 90% specificity (the observed sensitivity from receiver operating characteristic analysis estimates sensitivity of 5% at a 90% specificity). Noncycloplegic autorefraction on these same subjects had a screening sensitivity of 95% at a specificity of 90%.

Screening for refractive error is fraught with difficulty. Children can accommodate, masking their hyperopia, and pass the screening examination, or may do well on a task for a brief period of time but fatigue and inappropriately fail. All these effects make it difficult to determine which test is the best to use in a given population. The authors of the Vision in Preschoolers study are to be commended for completing the first phase of this large study, where multiple screening instruments are compared on the same children and where subgroup analysis can point to which instrument is best for detecting a given condition. Use of manual cycloplegic retinoscopy as the GSE has likely introduced misclassification of some subjects. I urge that, in the future, such studies incorporate cycloplegic autorefraction for the GSE to minimize this effect.

Joseph M. Miller, MD, MPH
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References

Author reply
Dear Editor:
Dr Miller raises the important issue of selection of a method for determining refractive error during the comprehensive eye examination in the Vision in Preschoolers Study. A primary purpose of the comprehensive eye examination was to obtain an accurate measurement of refractive error to allow appropriate classification of each child. The method we chose to use was cycloplegic retinoscopy by eye care professionals experienced in working with young children. Cycloplegic retinoscopy has been used as the basis of comparison in a number of studies assessing the accuracy of autorefractors in preschool children. In addition, it is accepted as a method to determine cycloplegic refraction in all of the Amblyopia Treatment Studies that include preschoolers with high degrees of hyperopia and anisometropia.

Zadnik et al have pointed out that a high level of repeatability, such as that shown by autorefraction, is critical in longitudinal studies, such as the Correction of Myopia Evaluation Trial referred to by Dr Miller, in which repeated measurements over time are compared. However, the studies cited by Dr Miller as supporting the superiority of cycloplegic autorefraction over cycloplegic retinoscopy in measurement of refractive error do not provide evidence that cycloplegic autorefraction would better meet our goal of obtaining an accurate measurement of refractive error in a preschool population with a wide spectrum of refractive errors. For example, Zadnik et al’s study evaluated the repeatability of methods for assessing refractive error in 40 adults, none of whom met the Vision in Preschoolers criteria for hyperopia or astigmatism. The studies of repeatability by Harvey et al were performed in a Native American preschool population having almost exclusively astigmatism, and not hyperopia or anisometropia. Furthermore, it is interesting to note that cycloplegic retinoscopy was the standard for assessing the accuracy of the measurements by the autorefractor in the Harvey et al study cited by Dr Miller.

In conclusion, cycloplegic retinoscopy is clearly an appropriate and accurate method to determine refractive error during a comprehensive eye examination in preschool chil-