EVALUATION OF THE SPOT VISION SCREENER IN YOUNG CHILDREN IN COSTA RICA.

Mendez MA, Arguello L, Martinez J, et al. J AAPOS 2015;19:441-444.

- While early detection improves visual acuity outcomes,[1,2] many preschool children do not receive recommended vision screening.[3]
- The American Academy of Pediatrics recommends automated vision screeners as an alternative to traditional vision screening in children aged 3–5 years.[4]
- The Spot Vision Screener is an automated vision screener that has been validated in selected populations within pediatric ophthalmology practices.[5–8]

PURPOSE[9]

To determine the sensitivity and specificity of the updated Spot Vision Screener (version 2.0.16) in detecting amblyogenic risk factors (ARFs) in a general pediatric population.

METHODS[9]

Children aged 2–9 years with no known eye complaints were examined at/after a pediatric health visit (n = 150), or screened at 3 preschools (n = 69).

Spot Vision Screening

Confirmatory examination by pediatric ophthalmologist.

- cover-uncover ocular motility testing.
- examination of anterior segment.
- cycloplegic retinoscopy.*
- dilated fundus examination.*

Children were divided into 3 age groups to determine gold standard results (ARF+/ARF–).†

Group 1	Group 2	Group 3
12–30 months of age (n=12)	31–48 months of age (n=93)	>48 months of age (n=114)

RESULTS[9]

Characteristics:

98% Hispanic

2% African American

average age **60** months

(range, 20–119 months)

ARFs by Spot Vision Screener

19.6%
(n=43‡)

Astigmatism (14.2%; n=31)

Other[l] (anisometropia, n=3; hyperopia, n=3; myopia, n=3)

Of the 31 children referred for astigmatism after Spot screening:

19 met AAPOS criteria† on examination

12 false positives¶ (false positive rate, 5.5%)

ARF findings:

All children underwent both Spot assessment and ophthalmological examination.

The most common risk factor was astigmatism, by both methods.

ARFs by ophthalmological examination

12.3%
(n=27)

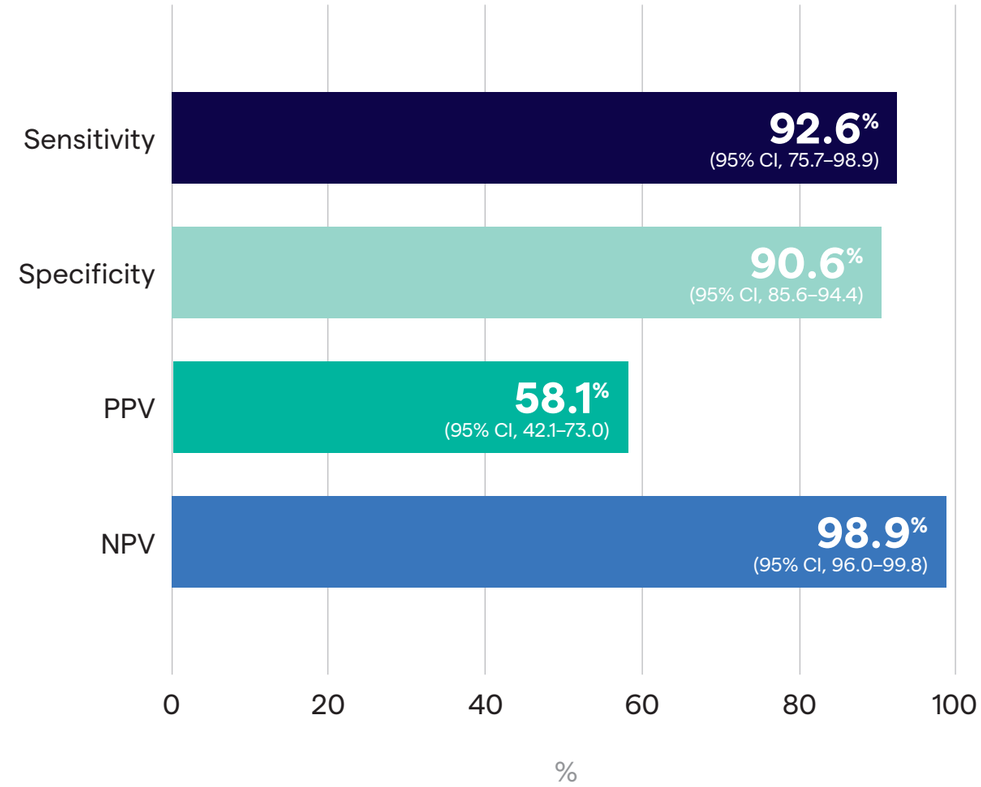
Astigmatism (8.7%; n=19)

Other (not specified, n=8)

All children who met AAPOS criteria for astigmatism on examination also showed astigmatism on Spot screening

RESULTS[9]

Spot Vision Screener performance in detecting AAPOS ARFs



Spot Vision Screener performance in detecting AAPOS ARFs

All children:	ARF+	ARF–	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
Spot referral/positive	n=25	n=18	92.6% (75.7-98.9)	90.6% (85.6-94.4)	58.1% (42.1-73.0)	98.9% (96.0-99.8)
Spot pass/negative	n=2	n=174				

ARF, amblyopia risk factors; CI, confidence interval; PPV, positive predictive value; NPV, negative predictive value

CONCLUSIONS[9]

The newest Spot Vision Screener demonstrated excellent sensitivity and specificity

- Spot sensitivity and specificity were higher in this real-world study than in validation trials.[6-8]
- Spot sensitivity and specificity (with updated software v.2.0.16) were higher in this real-world study than in validation trials.[5,9-11]
- The prevalence of ARFs in this general pediatric population (12.3%) is consistent with other reports.[13,14,15]
  - The high rate of referral for astigmatism may be associated with Hispanic ethnicity.[13]
  - The number of false positives suggests that adjustment to the manufacturer's criteria may improve specificity.[9]

** Cycloplegic retinoscopy and dilated fundus examination performed 30 minutes after instillation of 1–2 drops each of tropicamide 0.5%, phenylephrine 5% and cyclopentolate 1%*

† ARFs determined by physician's examination/diagnosis, and based on AAPOS guidelines

‡ No result obtained in 3 children, each of whom had no ARFs on subsequent examination

§ Results were analysed for Groups 2 and 3 only, due to low accrual in Group 1

‖ Some children were referred for more than one reason. Note: Of 3 children referred by Spot for 'gaze', 2 had strabismus per AAPOS criteria (1 exotropic; 1 hypertropic); the third child was not found to have strabismus

¶ False positive rate = false positives/false positives + true negatives

AAPOS, American Association for Pediatric Ophthalmology and Strabismus; CI, confidence interval; ARF, amblyopia risk factor; NC, not calculated, NPV, negative predictive value; PPV, positive predictive value

References:
1. Holmes JM, Lazar E, Melia BM, , et al. Pediatric Eye Disease Investigator Group. Effect of age on response to amblyopia treatment in children. Arch Ophthalmol 2011;129:1451-7. 2. Teed RG, Bui C, Morrison DG, Estes RL, Donahue SP. Amblyopia therapy in children identified by photoscreening. Ophthalmology 2010;117:159-62. 3. Kemper AR, Wallace DK, Patel N, Crews JE. Preschool vision testing by health providers in the United States: findings from the 2006-2007 Medical Expenditure Panel Survey. J AAPOS 2011;15:480-83. 4. Miller JM, Lessin HR, American Academy of Pediatrics Section on Ophthalmology, Committee on Practice and Ambulatory Medicine, American Academy of Ophthalmology, American Association for Pediatric Ophthalmology and Strabismus, American Association of Certified Orthoptists. Instrument-Based Pediatric Vision Screening Policy Statement. Pediatrics 2012;130:983-6. 5. Arnold RW, Arnold AW, Armitage MD, Shen JM, Hepler TE, Woodard TL. Pediatric Photoscreeners in High Risk Patients 2012: A Comparison Study of Plusoptix, iScreen and SPOT. Binocul Vis Strabolog Q Simms Romano 2013;28:20. 6. Silbert DI, Matta N. Performance of the Spot vision screener for the detection of amblyopia risk factors in children. J AAPOS 2014;18:169-72. 7. Garry GA, Donahue S. Validation of Spot screening device for amblyopia risk factors. J AAPOS 2014;18:476-80. 8. Peterseim MMP, Papa CE, Wilson ME, et al. The effectiveness of the Spot Vision Screener in detecting amblyopia risk factors. J AAPOS 2014;18:539-42. 9. Mendez MA, Arguello L, Martinez J, et al. Evaluation of the Spot Vision Screener in young children in Costa Rica. J AAPOS 2015;19:441-444. 10. Silbert DI, Matta N, Amanda L, Ely AL. Comparison of SureSight autorefractor and plusoptiX A09 photoscreener for vision screening in rural Honduras. J AAPOS 2014;18:42-44. 11. Arthur BW, Riyaz R, Rodriguez S, Wong J. Field testing of the plusoptiX S04 photoscreener. J AAPOS 2009;13:51-57. 12. Fozailoff A, Tarczy-Hornoch K, Cotter S, et al. Prevalence of astigmatism in 6- to 72-month-old African American and Hispanic children: The Multi-Ethnic Pediatric Eye Disease Study. Ophthalmology 2011;118(2):284-293. 13. Donahue SP, Arthur B, Neely DE, Arnold RW, Silbert D, Ruben JB. AAPOS Vision Screening Committee. Guidelines for automated preschool vision screening: a 10-year, evidence-based update. J AAPOS 2013;17:4-8. 14. Arnold RW. Amblyopia risk factor prevalence. J Pediatr Ophthalmol Strabismus 2013;50:213-17. 15. Varma R. Author reply on behalf of the Multi-Ethnic Pediatric Eye Disease Study and the Baltimore Pediatric Eye Disease Study Investigators. Ophthalmology 2012;119:1283-4.

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PERFORMANCE OF THE SPOT VISION SCREENER IN CHILDREN YOUNGER THAN 3 YEARS OF AGE.

Forcina BD, Peterseim MM, Wilson ME, et al. Am J Ophthalmol. 2017;178:79–83.

- Amblyopia is the most frequent cause of preventable vision loss among children.[1]
- In children under 3 years of age, identifying those at risk of amblyopia remains a clinical challenge in primary care.[2]
- The American Optometric Association recommends children have their first eye exam between 6 and 12 months of age, again between 3 and 5 years of age, and annual visits starting with grade school. However, vision screening may be helpful in identifying children at risk of vision problems until the child undergoes a comprehensive eye exam.[3]
- The American Academy of Pediatrics recommends instrument-based vision screening from the age of 12 months,[4] however, the United States Preventive Services Task force states that there is insufficient evidence to recommend vision screening in children under 3 years of age.[5]
- Early detection of amblyopia risk factors (ARFs) is advantageous, because younger children are more responsive to amblyopia therapy.[6]

PURPOSE[2]

- To prospectively evaluate the usefulness of the Spot Vision Screener ('Spot') for detection of ARFs in young children aged 6 months to 3 years.

METHODS[2]

- Children were tested with the Spot during a routine health visit between June 2012–April 2016 (software v.2.0.16).
- All children underwent a comprehensive ophthalmological examination, including cycloplegic refraction and sensorimotor testing.
- Ophthalmologists were masked to Spot results.

Spot Vision Screening →

Same-day examination by pediatric ophthalmologist

- Visual acuity.
- Stereopsis.
- Motility evaluation.
- Anterior segment evaluation.
- Cycloplegic retinoscopy.*
- Fundus examination.*

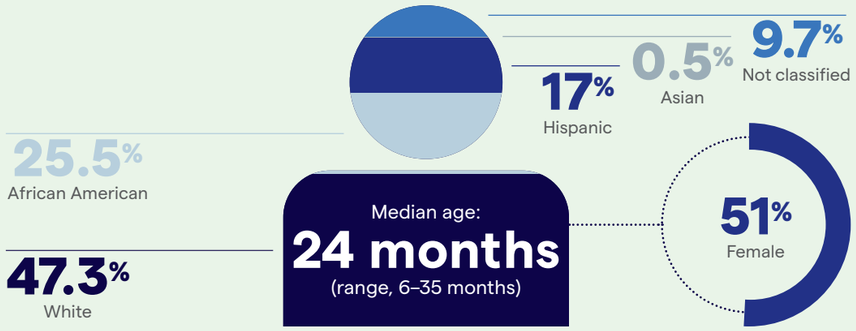
184
children aged 6 months to 3 years

Data collection and statistical methods

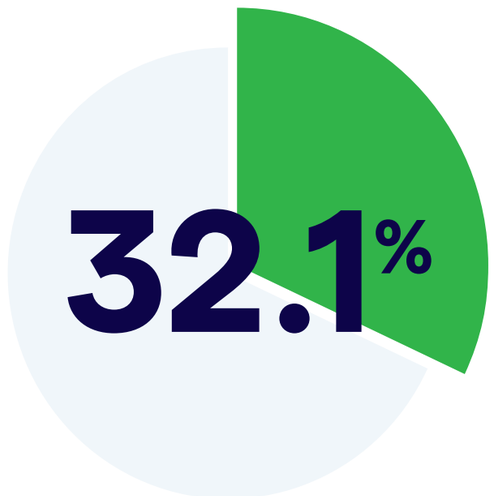
- Patients were considered to have amblyopia or ARFs on the basis of the physician's diagnosis, and per the 2013 AAPOS guidelines.[7]
- Children with media opacities of >1 mm or a diagnosis of amblyopia were categorised as ARF+.
- Children with a constant measurement of >8 prism diopters (PD) in primary position at distance or near at the time of examination, met the 2013 AAPOS guidelines for strabismus referral.
- No result on Spot screening triggered automatic referral.

RESULTS[2]

Patient characteristics



ARF prevalence

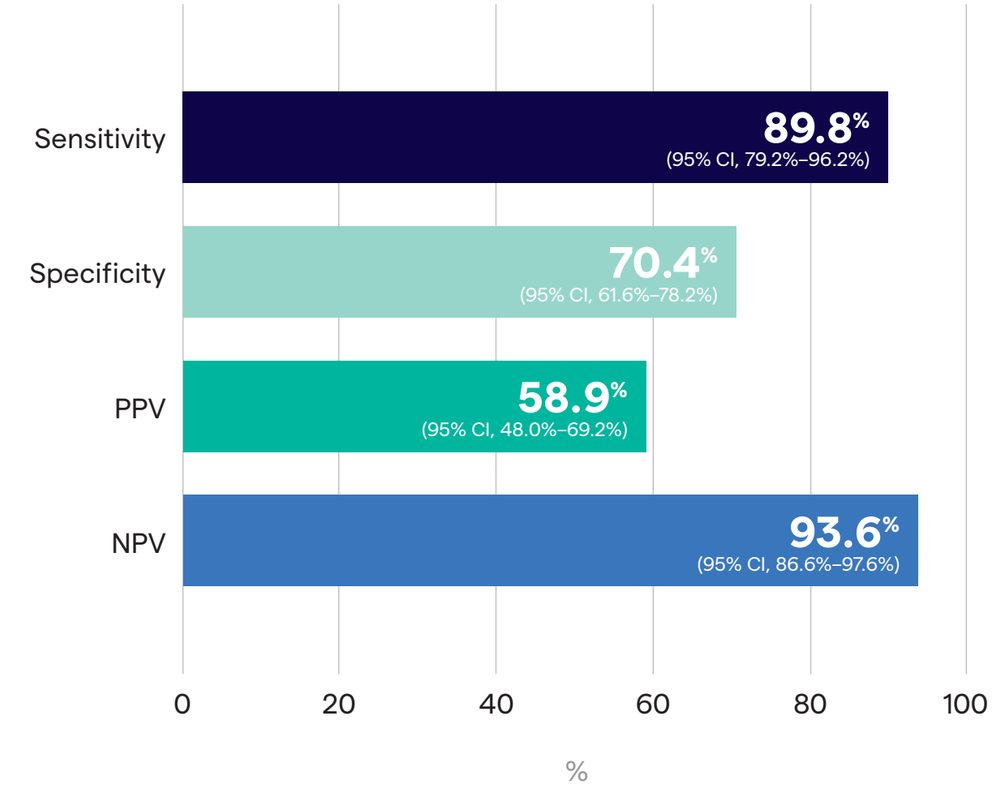


False negatives (n = 6):

- Failed to detect 5 diopters of hyperopia in 1 patient.
- Failed to detect 4 diopters of anisometropia in 1 patient with left eye pseudophakia.
- Underestimated the amount of astigmatism in 1 patient.
- 2 patients demonstrated constant strabismus on examination of >8 PD.

RESULTS[2]

Performance metrics of Spot Vision Screener in detecting ARFs (all children)



Spot performance metrics by age group

Age Groups	ARF+	ARF-	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
Patients 6-11 months						
Spot referral/positive	3	7	100% (29.2-100)	63.2% (38.4-83.7)	30% (6.7-65.3)	100% (73.5-100)
Spot pass/negative	0	12				
Patients 12-23 months						
Spot referral/positive	14	10	82.4% (56.6-96.2)	68.8% (50.0-83.9)	58.3% (36.6-77.9)	88.0% (68.8-97.5)
Spot pass/negative	3	22				
Patients 24-35 months						
Spot referral/positive	36	20	92.3% (79.1-98.4)	73.0% (61.4-82.7)	64.3% (50.4-76.6)	94.7% (85.4-98.9)
Spot pass/negative	3	54				

- Sensitivity was highest in the group aged 6–11 months (100%).
- PPV was highest in those aged 24–35 months (64.3%).

CONCLUSIONS[2]

The Spot Vision Screener was an effective method of detecting ARFs in very young children.

- In children aged 6–35 months, the Spot demonstrated good sensitivity and specificity for detecting ARFs per 2013 AAPOS criteria, with few false negatives.
- This study suggests that the Spot may be an effective vision screening tool, even in very young children who are less able to be co-operative with optotype-based vision screening.
- Larger studies in the general clinical setting are warranted.

** Cycloplegic retinoscopy and dilated fundus examination were performed 30 minutes after instillation of 1 drop of proparacaine hydrochloride ophthalmic solution USP 0.5%, followed by 1–2 drops each of tropicamide 1%, phenylephrine 2.5% and cyclopentolate 1%. If not performed on the day of Spot screening, these tests had to have been performed within the preceding 6 months.*

AAPOS, American Association for Pediatric Ophthalmology and Strabismus; CI, confidence interval; ARF, amblyopia risk factor; NPV, negative predictive value; PD, prism diopter; PPV, positive predictive value

References:

1. Gunton KB. Advances in amblyopia: what have we learned from PEDIG trials? Pediatrics. 2013;131(3):540–547. 2. Forcina BD, Peterseim MM, Wilson ME, et al. Performance of the Spot Vision Screener in Children Younger Than 3 Years of Age. Am J Ophthalmol. 2017;178:79–83. 3. American Optometric Association. Evidence-Based Clinical Practice Guideline: Comprehensive Pediatric Eye and Vision Examination. February 2017. Available at https://www.aoa.org/practice/clinical-guidelines/clinical-practice-guidelines. Accessed 7 October, 2020. 4. Donahue SP, Baker CN, Committee on Practice and Ambulatory Medicine, American Academy of Pediatrics, Section on Ophthalmology, American Academy of Pediatrics, American Association of Certified Orthoptists, American Association for Pediatric Ophthalmology and Strabismus, American Academy of Ophthalmology. Procedures for the evaluation of the visual system by pediatricians. Pediatrics. 2016;137:1. 5. U.S. Preventive Services Task Force. Final Update Summary: Visual Impairment in Children Ages 1–5 Screening. September 2016. Available at: https://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/visual-impairment-in-children-ages-1-5-screening. 6. Holmes JM, Lazar JM, Melia BM, et al. Effect of age on response to amblyopia treatment in children. Arch Ophthalmol. 2011; 129(11):1451–1457. 7. Donahue SP, Arthur B, Neely DE, Arnold RW, Silbert D, Ruben JB, AAPOS Vision Screening Committee. Guidelines for automated preschool vision screening: a 10-year, evidence-based update. J AAPOS. 2013;17(1):4–8.

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USE OF THE SPOT VISION SCREENER FOR PATIENTS WITH DEVELOPMENTAL DISABILITY.

Marzolf AL, Peterseim MM, Forcina BD, Papa C, Wilson ME, Cheeseman EW and Trivedi RH. J AAPOS 2017;21:313–315.

- Ophthalmic pathology is highly prevalent among children with developmental disabilities.[1–4]
- However, ophthalmologic examination can be challenging, costly, and stressful for these children.[5]
- Instrument-based screening represents a quick, cost-effective method of assessing risk of significant ocular pathology.[5]

PURPOSE[5]

To determine the effectiveness of the Spot Vision Screener* ('Spot') in detecting amblyopia risk factors (ARFs) in children with developmental disabilities.

METHODS[5]

The study included 100 children aged 6 months to 16 years with developmental disabilities who presented for complete paediatric ophthalmological examination.

Disabilities included:†

- Learning disability (n = 36).
- Developmental delay (n = 24).
- Attention deficit disorder (n = 20).
- Down syndrome (n = 7).
- Cerebral palsy (n = 6).
- Autistic spectrum disorder (n = 5).
- Global developmental delay (n = 2).
- Tourette syndrome (n = 2).
- Microdeletion syndrome (n = 1).
- Delayed milestones/ developmental coordination deficit (n = 1).
- Chromosome 7 deletion (n = 1).
- Prader-Willi (n = 1).

children with developmental disabilities

Spot screening by trained lay personnel

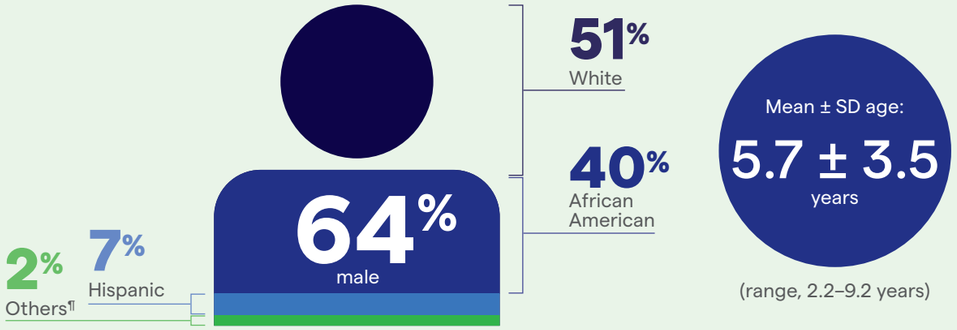
- Pupillary diameter.
- Ocular alignment.
- Estimated binocular refraction.
- Referral recommendation.

Examination by paediatric ophthalmologist (masked to Spot results)

- Visual acuity.
- Stereopsis.
- Ocular motility.
- Anterior segment examination.
- Cycloplegic retinoscopy.‡
- Fundus examination.‡

RESULTS[5]

Characteristics:



The majority of children were successfully evaluated with the Spot

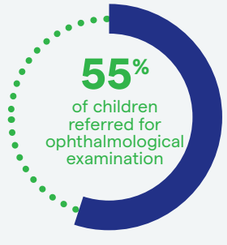
The Spot Vision Screener was able to successfully evaluate 91 children.

- No reading obtained for 9 children (all became automatic referrals).
  - Of these, 6 children had ARFs on examination (myopia n = 3; strabismus, n = 2; hyperopia, n = 2; anisometropia, n = 2; media opacity, n = 1); no result obtained for 3 children.

Spot referrals and ARF prevalence

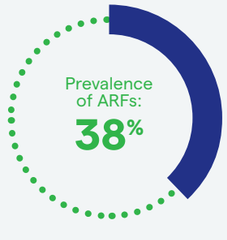
Overall, the Spot referred 55% of children.§

- See **Table 1.**



In this cohort, the prevalence of ARFs per the AAPOS 2013 guidelines was 38%.

- 22 children met the AAPOS guidelines for strabismus, 12 for astigmatism, 10 for myopia, 8 for hyperopia, 8 for anisometropia, and 1 for significant media opacity.



6 children not referred by the Spot were found to have ARFs on ophthalmological examination.

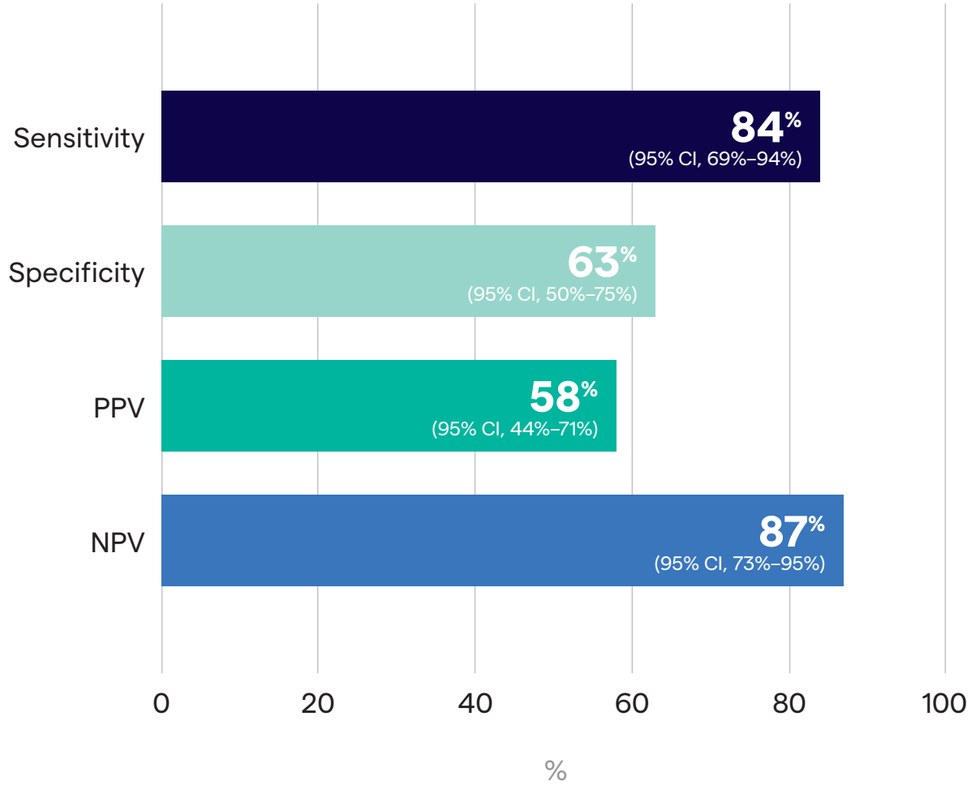
- 4 children had strabismus, 1 hypertropia, and 1 astigmatism.

RESULTS[5]

Table 1. Spot performance in detecting AAPOS ARFs in children with developmental disability

n	ARF +	ARF –
Spot referral/positive (+ inconclusive)	24 (+6) = 32	20 (+3) = 23
Spot pass/negative	6	39

Spot Vision Screener performance in detecting AAPOS ARFs



Study limitations[5]

These sensitivity and specificity findings reflect the difficulty for children with disabilities in holding visual fixation long enough to obtain reliable information.

CONCLUSIONS[5]

- The Spot Vision Screener is a useful tool for the initial screening of children with developmental disabilities for ARFs.[5]
- The Spot (software v.2.1.4) demonstrated good sensitivity and moderate specificity in this population.[5]
- Screening for ARFs with the Spot is less predictable in this population than in general paediatric populations.[6–9]
- Ideally, children with learning disabilities who undergo screening should also receive a complete ophthalmological examination if possible.[5]
- Further larger studies are warranted.[5]

** Spot software v.2.1.4 with manufacturer out-ot-the-box criteria*

† Some individuals had more than one disability diagnosis

‡ Performed 30–40 minutes after instillation of 1 drop of proparacaine hydrochloride solution USP 0.5%, followed by 1–2 drops of tropicamide 1%, phenylephrine 2.5% and cyclopentolate 1%

¶ 1% American Indian; 8% other ethnicity; numbers do not add to 100%

§ Including the 9 automatic referrals

AAPOS, American Association for Pediatric Ophthalmology and Strabismus; ARF, amblyopia risk factor; CI, confidence interval; NPV, negative predictive value; PPV, positive predictive value; SD, standard deviation

References:
1. American Academy of Ophthalmology Pediatric Ophthalmology/Strabismus Panel. Preferred Practice Pattern_ Guidelines. Pediatric Eye Evaluations. San Francisco, CA:American Academy of Ophthalmology. Available at: www.aao.org/ppp; 2012. 2. Peterseim MM, Arnold RW. Vision screening: program models. Available at: www.aao.org/pediatric-center-detail/vision-screeningprogram-models. 3. Bull MJ. Committee on Genetics. Health supervision for children with Down syndrome. Pediatrics 2011;128:393–406. 4. Ikeda J, Bradley VD, Ultmann M, Maxim R, Cruz OA. Brief report: incidence of ophthalmic disorders in children with autism. J Autism Dev Disord 2013;43:1447–1451. 5. Marzolf AL, Peterseim M, Forcina BD, Papa C, Wilson ME, Cheeseman EW and Trivedi R. Use of the Spot Vision Screener for patients with developmental disability. J AAPOS 2017;21:313–315. 6. Peterseim MMW, Papa CE, Wilson ME, et al. The effectiveness of the Spot Vision Screener in detecting amblyopia risk factors. J AAPOS 2014;18:539–542. 7. Silbert DI, Matta NS. Performance of the Spot vision screener for the detection of amblyopia risk factors in children. J AAPOS 2014;18:169–172. 8. Mendez MA, Arguello L, Martinez J, et al. Evaluation of the Spot vision screener in young children in Costa Rica. J AAPOS 2015;19:441–444. 9. Gary GA, Donahue SP. Validation of Spot screening device for amblyopia risk factors. J AAPOS 2014;18:476–480.

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