Accuracy of the SPOT Pediatric Vision Screener Compared to Comprehensive Eye Exam in Children Aged 0 to 36 months

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Purpose

- Screening for potential risk factors in young children is crucial in preventing amblyopia. However, screening standards for children under the age of 3 have not been established. Previous studies by the Vision in Preschoolers (VIP) Group, have shown that screening devices, such as Retinomax and SureSight, can be used by licensed, eye-care professionals (LEP), and nurse or lay screeners to detect significant refractive errors in children. The SPOT, a handheld photoscreening device that uses infrared reflections to determine refractive error, is a similar device that has not previously been studied in this age group.
- This pilot study is investigating the efficacy of the SPOT by Welch Allyn as a screening device for refractive error and strabismus which are significant risk factors for amblyopia in children aged 0-36 months.

Methods

247 subjects, aged 3 to 36 months, enrolled in Early Head Start and Early Intervention programs in and around the Boston and Springfield, MA areas were first screened with the SPOT by a lay screener.
107 females ranging in age from 5 to 36 months with a mean age of 32.88 months (SD 8.92 months)
140 males ranging in age from 3 to 36 months with a mean age of 23.71 months (SD 8.44 months).
Lay screeners consisted of NECO students and staff associated with the New England Eye Mobile Clinic.
Subjects were then sent for a masked Gold Standard Exam (GSE) on the Mobile Eye Clinic by a licensed Pediatric optometrist. GSE included history provided by a parent or guardian, vision assessment using fixation preference, ocular motility assessment, pupillary exam, cover test, Bruckner test, cycloplegic retinoscopy (45 minutes after the instillation of 2 drops of 1% cyclopentolate hydrochloride separated 5 minutes apart) and dilated ocular health exam.
Pass/Fail criteria for GSE was determined based on definition of amblyogenic risk factors from a modified adaptation of criteria from the VIP studies[1] as shown in Table 1. A 'pass' or 'fail' status was assigned to each subject by a pre-determined proprietary algorithm for the SPOT.

Table 1: Definition of Amblyogenic Risk Factors Identified Through GSE

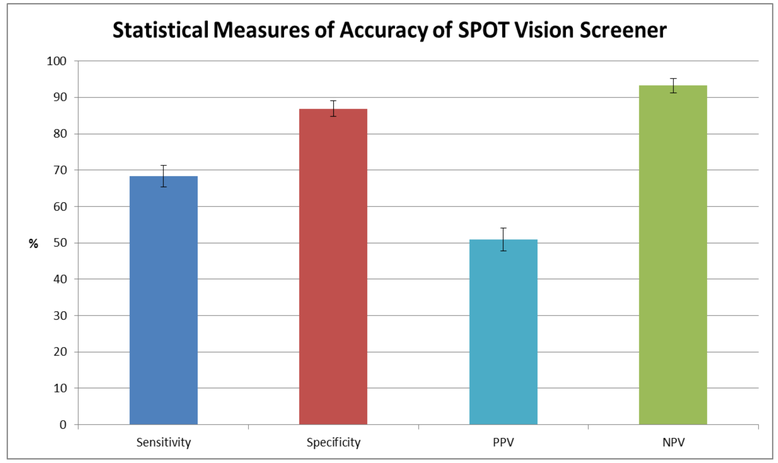
RISK FACTOR	CRITERIA
REFRACTIVE ERROR	HYPEROPIA >4.50D in any meridian MYOPIA >2.00D in any meridian ASTIGMATISM >1.50D between principal meridians ANISOMETROPIA 1.00-D interocular difference in hyperopia; 3.00-D interocular difference in myopia; 1.50-D interocular difference in astigmatism; antimetropic difference 1.00 D and one eye 1.00 D of hyperopia; antimetropic difference 3.00 D and one eye 2.00 D of myopia
STRABISMUS	Any heterotropia in primary gaze
MEDIA OPACITY	Any media opacity obscuring the visual axis

Results

The sensitivity of the SPOT Vision Screener was 68.29% (95% CI 62.49 – 74.10%), the specificity was 86.89% (955% CI 82.68 – 91.10%), the positive predictive value was 50.91% (95% CI 47.73 – 54.09%), and the negative predictive value was 93.23% (95% CI 91.30 – 95.15%). Table 2 below shows the breakdown of analysis.

Table 2: Pass/Fail Results for GSE vs. SPOT Vision Screener

		SPOT		
Gold Standard		Pass	Fail	Totals
	Pass	179	27	206
	Fail	13	28	41
Totals		192	55	247



Conclusions

- This study is a pilot for others to follow. The results suggest that the SPOT agrees well with GSE among children aged 0-36 months without amblyogenic risk factors. It has reasonable sensitivity but is limited in identifying children in this age group with high hyperopia, which agrees with past studies on the device with older children[2].
- The SPOT performs similarly to other devices used by lay screeners to detect amblyopia, strabismus, and/or significant refractive error for children over 3 years as previously reported from the VIP study[1]. Limiting factors to the present study include small sample size and a non-normative database.
- Future studies are in progress, and evaluation of the pass/fail criteria for the SPOT is ongoing.

Acknowledgments

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References

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