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Validity of the VERA visual skills screening

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Accommodation;
Binocular vision;
Ocular motility;
Learning-related vision problems

Abstract

PURPOSE: Most school vision screenings test only visual acuity. There is a need for a valid, easily administered test that screens for a wider variety of learning-related vision problems. Visual Efficiency RAting (VERA) is a software program designed for schools to detect both routine vision problems and visual skill problems. The purpose of this study was to compare the VERA visual skills screening with the optometric assessment of binocular, accommodative, and ocular motor skills.

METHODS: One hundred fifty-four children from grades 3 through 5 were evaluated using the VERA visual skills screening, a clinical battery of visual skills testing, the Convergence Insufficiency Symptom Survey, and 2 reading tests.

RESULTS: The sensitivity of VERA in detecting visual skills problems was 45%, and the specificity was 83%. Sensitivity increased to 64% and specificity to 100% in smaller groups of children when overlays of symptoms, classroom behaviors, and reading skills were included.

CONCLUSIONS: VERA has fairly good sensitivity and very good specificity in detecting visual skills problems. Given that the majority of visual skill deficits currently go undetected, VERA can be considered a reasonably effective method of in-school visual skills screening.

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Although it is acknowledged that children require good vision for optimal classroom performance,[1,2] there is no consensus about what constitutes adequate or appropriate vision for classroom use. The American Optometric Association (AOA) Optometric Clinical Practice Guidelines for Learning Related Vision Problems[1] cites a wide range of visual parameters, including visual acuity, refractive status, ocular health, binocularity, accommodation, ocular motility, and visual processing, as necessary for effective learning. The American Academy of Pediatrics (along with the Academies of Ophthalmology and Pediatric Ophthalmology), however, argues that many of these visual parameters are not related to learning and classroom performance.[3] This major difference in opinion between the 2 eye care professions has contributed to a lack of agreement in school vision screening policy across the country. Although it has become accepted in most states that schools have a role to play in screening for vision problems, there is wide disparity among states and even school districts about how and when to screen children. At one end of the spectrum, 10 states currently have no requirements for school vision screening.[4] On the other end, 3 states have gone beyond screening and implemented mandatory eye examinations by an optometrist or ophthalmologist upon school entrance, whereas 2 other states require an eye examination for children upon entrance into special education services (personal communication, Sherry Cooper, associate director State Government Relations, September 13, 2010). The AOA argues that a mandatory eye examination before first grade is the most effective way to detect vision problems in children.[5,6] Ideally, children would have regular eye examinations throughout childhood to diagnose and treat visual

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problems that can affect learning. But this ideal is not often realized, and there is a need for ongoing valid and effective vision screening throughout the school years.[7]

Hyperopia historically has been the most consistently identified visual risk factor for reading problems,[8-10] and recent studies have found that uncorrected hyperopia affects both development of early literacy skills[11] and visual motor skills.[12] Numerous studies have found that children with vergence, accommodative, and ocular motor deficits are at greater risk for reading and learning problems.[2,13-23] Treatment of vision problems (with vision therapy or prism) has been found in a group of studies to result in either a decrease in reading related symptoms[24,25] or improved reading performance.[26-31]

The impact of these visual skills on learning stems from the extensive near visual demands in the classroom. One study found that the average elementary school child spends 54% of classroom time engaged in reading and desk work each day, with an additional 21% in copying tasks utilizing near-distance-near viewing.[32] This is usually followed by near centered homework after school. Efficient near visual skills assume even greater importance once a child has learned basic reading skills and is expected to utilize reading to extract and learn information in nearly every other subject.[33]

Few population-based studies discuss the prevalence of vergence, accommodative, and ocular motor problems, but prevalence estimates range from 15% to 20% of the school-age population.[1] Convergence insufficiency has received the most attention, with studies indicating a prevalence of 3% to 5%.[25,34] Extrapolation of these data suggests that 1 child in each classroom of 25 will have a diagnosis of convergence insufficiency. When combined with the range of other near visual disorders that can occur in children, the estimate of 15% to 20% is quite plausible, with even higher rates possible in children with reading and learning problems.[17,35,36] Several clinic-based studies of children presenting for eye examinations found a combined prevalence of 19.7% to 22.3% for accommodative and vergence disorders.[37,38]

Given the prevalence of these disorders and the potential impact on school and reading performance, it would seem prudent for schools to utilize screenings that can detect such problems.[6] In addition, education policymakers are intent on enhancing the identification and remediation of reading problems.[39] The National Parent Teacher Association passed a resolution in 1999 calling for more visual skill testing to be incorporated in school vision screenings.[40] The majority of school vision screenings only test distance visual acuity, however.[41,42] Testing of visual acuity alone will detect some uncorrected refractive errors, amblyopia, and pathology that affects the visual pathway. However, clinically meaningful amounts of hyperopia can be missed, as distance visual acuity is usually normal. The typical distance Snellen chart screening provides no information about binocular, accommodative, or ocular motor skills. In addition, parents who are told by the school that their child has passed a vision screening can erroneously assume that all aspects of their child's vision are normal, which can result in them not seeking appropriate vision care.[5]

The Modified Clinical Technique (MCT) is regarded as the best comprehensive visual screening but requires a trained eye care provider. It is not cost effective for routine school use, and, although it was designed to detect all visual disorders, does not include functional or performance-oriented testing beyond a cover test.[43] Instruments, such as the Titmus tester or the Keystone Telebinocular, provide somewhat more information than visual acuity alone. They are designed to test some aspects of binocularity, such as stereopsis, phoria, and suppression, and they have a plus lens test to detect hyperopia. A significant limitation of these instruments is that they do not measure performance over time. Recent studies have pointed to the importance of accommodative facility and vergence facility in the assessment of binocularity and accommodation.[18,44-46] With facility testing, responses are measured over time to detect the impact of fatigue on the visual system. These tests have become routine in the evaluation of binocular and accommodative disorders.[47] Goss[45] reanalyzed the data of Garcia et al.[44] on accommodative facility in individuals from ages 10 to 30 and found that accommodative facility testing with lens flippers had 91.7% sensitivity and 91.7% specificity as a screening test in detecting accommodative and binocular problems.[45] Instruments, such as the Titmus tester, do not test accommodative or vergence facility, nor do they test ocular motility.

The most ambitious effort to include functional screening measures to detect learning-related vision problems has been the New York State Optometric Association (NYSOA) screening battery.[48] The test is designed to be administered by trained parent volunteers, and, in addition to distance and near visual acuity, includes screening tests for hyperopia, convergence, fusion (with the Keystone Telebinocular), stereopsis, saccadic skills, visual motor integration, and color vision. A validation study found sensitivity of 72% and specificity of 65% when compared with professional eye examination and also found that the Snellen test missed 75% of the visual problems that were detected in the full examinations.[48]

Only a small group of studies has used the NYSOA since the original validation study in 1985, and most are from 1 research group, suggesting that this battery is not in widespread use.[20,49-54] Several practical shortcomings of this test battery may contribute to its lack of popularity with school personnel. The battery is quite lengthy, and both optometric involvement and trained parent volunteers are needed. It is not practical for a school nurse to do the screening alone, nor is it likely that schools could provide enough of their own personnel for the screening. One study raised concerns about the sensitivity of the battery as well.[52]

A 1993 study by Hatch[55] describes a school screening battery called the Visual Efficiency RAting (VERA) that addresses some of these concerns. VERA is a software program designed for school nurses to screen for binocular, accommodative, and ocular motor disorders, in addition to hyperopia and visual acuity. The protocol is a 2-tiered screening in which children must pass visual acuity, hyperopia, and stereopsis screening tests before being administered a visual skills battery. The visual skills tested include vergence facility, accommodative facility, and saccadic tracking. Analysis found VERA to have 75% sensitivity and 93% specificity when compared with professional eye examination data in 36 subjects. The analysis was not restricted to visual skills data but also included acuity and refractive data. He concluded that VERA was an acceptable alternative to other measures for screening visual skills and could be effectively administered by a school nurse.

Since this article was published, VERA has been modified.[56] Several tests have been eliminated or modified, and new pass/fail criteria have been added. The goal of the current study is to investigate the validity of the latest version of VERA through comparison of VERA visual skills results to standard clinical measures of binocular, accommodative, and ocular motor function in a larger sample.

Methods

Six elementary schools were recruited to participate in the study (4 suburban public schools and 2 urban private schools). Major inclusion criteria included children from grades 3 through 5, 20/25 or better distance visual acuity in each eye, passing a hyperopia screening test (20/30 or worse with +1.50 lenses), and 500" of arc on random dot stereopsis testing. One hundred fifty-four children were tested, with an age range from 8 to 12. The number of subjects tested at each school ranged from 16 to 35. Fifty-three percent were girls and 47% were boys. Exclusion criteria included children with a reading level below the 10th percentile and children with attention or communication difficulties as judged by school personnel that would make testing unreliable. Children with a diagnosis of attention deficit disorder/attention deficit hyperactivity disorder were excluded only if school personnel felt the child would not be cooperative in testing. Schools were asked to target children whose teachers felt they were struggling or underachieving in the classroom to get a wider spread of reading and academic abilities and to increase the parents' motivation to allow their child to participate. Our intent was also to increase the likely prevalence of vision skill problems to provide a better measure of the sensitivity and specificity of the VERA protocol.

Institutional review board approval was obtained for the study. Informed consent and assent were obtained from all parent/guardians and study participants. The children's test results were shared with their school, parents, or guardian. Follow-up care for children who failed the screening was provided at no cost to families who did not have access to appropriate eye care.

Testing consisted of the VERA Visual Skills module, a battery of clinical visual skills tests, the Convergence Insufficiency Symptom Survey (CISS),[25,57] and the Word Recognition and Fluency subtests from the Woodcock-Johnson III Tests of Achievement.[58] Each child's teacher filled out a classroom behavior survey that is also part of the VERA protocol (*see* Figure 1). The VERA was performed on a laptop computer and took about 10 to 12 minutes per child. All of the VERA tests were administered by 2 testers with extensive experience with VERA. The optometric testing battery was administered by an optometrist, 2 optometry students, and a trained vision therapist under the supervision of the first author. A graduate student in education administered the reading tests. The order of testing was random, with 6 different stations for each child to pass through. All of the testers were masked to the other test results. Testing environment was different in each school but consisted of either a single large room (library or cafeteria) or 2 adjacent classrooms for visual testing and a separate quiet area for reading testing.

The VERA visual skills tests consist of a saccadic test, 2 accommodative facility tests, and a vergence facility test. The instructional sets are standardized and appear on the screen before each test (*see* Figure 2). Each of the test scores is compared with an age-normed database of 1,500 children. The results are displayed as a percentile score for each test and a cumulative percentile score with categories of pass, fail, and borderline.

For the saccadic test, 15 empty boxes are arranged on the screen (*see* Figure 3). Numbers are presented sequentially in each box in a pattern that mimics reading. The child is instructed to report the last number that is exposed. The tester then enters this number. After a practice screen (or screens), the test consists of 9 trials.

The accommodative facility test is a 2-part biocular task. The child holds a lens holder with 1 side having a red filter and a +1.50 lens and the other side having a green filter with a –2.00 lens. Each screen contains a box with three 20/50 size numbers that are only seen by 1 eye at a time. The child is instructed to make the numbers clear as quickly as possible and read the numbers out loud. The tester enters "0" or "1" for incorrect or correct, and the next screen presents 3 new numbers seen by the opposite eye. The child must alternately stimulate and relax accommodation to clear the numbers. The test lasts 60 seconds. For the second part of the test, the lens holder is reversed so that the child is now stimulating or relaxing accommodation with the opposite eye. In this study, a 40-cm working distance was established with a string attached to the computer screen and monitored by the tester.

The vergence facility test consists of a random dot stereogram with a total vergence demand of 8 base out or 4 base in. When the stereogram is fused, the child is able to perceive a number from 1 to 4. The child reports the number that is seen and the tester enters this number. The test alternately presents base in and base out stereograms. This test lasts 90 seconds.

All optometric testing used a standardized protocol and instructional set. The tests are listed in Table 1. For consistency, each tester performed the same tests on all of the children. The first author administered the first 4 tests, a team of 2 trained optometry students administered the accommodative facility tests, and the Developmental Eye Movement (DEM) test and CISS were administered by a College of Optometrists in Vision Development-certified vision therapist.

STUDENT: ______________________________ OBSERVATION DATE(S): ______________

OBSERVER(S): ____

BEHAVIORAL INDICATOR CHECKLIST
INDICATORS OF VISION PERFORMANCE DIFFICULTIES

VISUAL

__ Difficulty with or avoidance of tasks requiring concentration, memory, reading or problem solving
__ Poor memory or concentration, trouble with spelling, vocabulary and grammar or inability to complete work during a given time frame
__ Complains of headache associated with near work
__ Complains of double vision or of blurry vision (far or near)
__ Covers or closes one eye when reading or doing near tasks
__ Complains of discomfort or inability to learn in tasks demanding consistent attention to fine detail
__ Tilts head extremely or works to one side of desk
__ Either eye turns in or out
__ Rubs eyes or forehead frequently

VISUAL-MOTOR

__ Poor physical or athletic performance (particularly poor spatial awareness)
__ Holds reading material very close to face
__ Writes in small, cramped style
__ Makes frequent errors in copying
__ Complains of words or letters jumping around
__ Loses place while reading
__ Uses finger to keep place
__ Handwriting is sloppy
__ Easily frustrated trying to draw figures

READING/LANGUAGE

__ Reverses letters or words
__ Omits words/letters when reading or writing
__ Spells poorly
__ Tires easily when reading
__ Performs below ability level for no obvious reason

ATTENTION

__ Trouble sitting still; fidgets frequently
__ Poor attention to reading
__ Responds to directions poorly
__ Behavior problems (particularly those related to frustration in the learning environment)
__ Displays tiredness or lethargy during the school day
__ Indifference to academic satisfaction and/or classroom work performance; and/or expressions of discouragement related to schoolwork
__ Trouble remembering or relating to material that is read

COMMENTS

Figure 1 VERA classroom behavior survey.

All testing followed accepted clinical protocol[47] except for accommodative facility. Accommodative facility testing differed in that VERA requires the child to read 3 numbers with each lens. This is to ensure that the child is actually able to see the numbers instead of simply, and perhaps erroneously, declaring the numbers clear. We designed a similar protocol based on norms developed by Scheiman et al.[59] in which children read 3 numbers with each lens. For the current study, a chart was designed so that 3 new 20/30-size numbers were exposed with each flip of the lenses (*see* Figure 4). Subjects received credit only if they were able to read all 3 numbers correctly. The test was done binocularly and then repeated monocularly with the right eye. A 40-cm test distance was established with a string attached to the test surface and monitored throughout testing.

The clinical skills tests that were performed included cover test at distance and near with prism bar neutralization, monocular accommodative amplitude (push away, right eye only), near point of convergence with Gulden rule and single row of reduced 20/30 letters, step vergences with prism bar, vergence facility at 16" with 12BO/3BI, binocular and monocular accommodative facility testing with +2/-2 flippers, and the DEM. Table 1 also includes the pass/fail criteria for each test. For near point of convergence, the cutoff was 6 cm.[25] For the other tests, failure

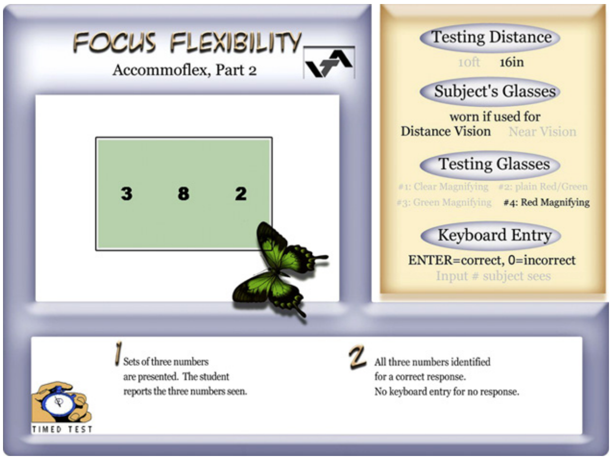

Figure 2 VERA test screen.

was considered to be 1 standard deviation or more below the mean.[47,60]

The ability of the VERA screening test to identify children with and without visual skills problems was characterized by the sensitivity and specificity of the test. The sensitivity of the test is calculated as the percentage of children with visual skills problems correctly identified by the VERA screener. For the VERA to be deemed a useful test for ruling out visual skills problems, it should have a high sensitivity (or low rate of false-negative results). The specificity is the percentage of children without visual skills problems correctly identified by VERA. A high specificity (or low rate of false-positive results) is necessary to conclude that the VERA is a useful tool for confirming visual skills problems. Sensitivity and specificity were first calculated using all subjects enrolled in the study. Additional calculations were performed for subsets of the sample based on symptom level using the CISS, reading level using the Woodcock-Johnson III Tests of Achievement, and classroom behavior using the VERA Classroom Behavior Survey.

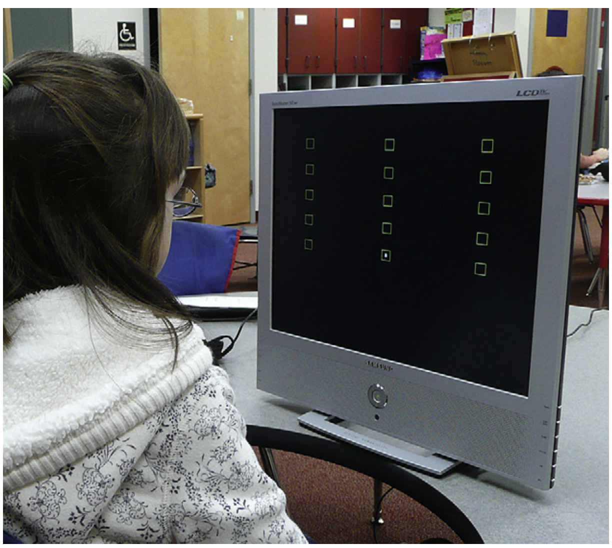

Figure 3 VERA saccadic test on desktop monitor.

Table 1 Pass/fail classification for visual skills

Test	Definition of "fail"	Failed n (%)
NPC (accom target)	Break ≥6 cm OR recovery ≥10 cm	20 (13%)
Step vergence (@ 40 cm)	BO blur or break ≤15 OR BO recovery ≤10 OR Fails Sheards OR BI blur or break ≤7 OR BI recovery ≤3	28 (18%)
Vergence facility (12 BO/3 BI)	≤8 cycles/min	51 (33%)
Accommodative amplitude (pull–away)	≥9.5 if 8-9 years old ≥10 if 10 years or older	18 (12%)
BAF (reads 3 letters)	≤5 flips/min	32 (21%)
MAF (reads 3 letters)	≤9 flips/min	68 (44%)
DEM	≤15th percentile for time OR errors	76 (49%)
Outcome 1	Failing 2 or more of the tests above	82 (53%)
Outcome 2	Failing 3 or more of the tests above	47 (31%)
Outcome 3	Failing 2 or more of the tests above (excluding DEM)	56 (36%)

NPC = near point of convergence; BO = base out; BI = base in; BAF = binocular accommodative facility; MAF = monocular accommodative facility; DEM = developmental eye movement test.

Results

A pilot study in 2005 (unpublished data) with 85 subjects was used to set cut points for pass, fail, and borderline based on the cumulative percentile score of the VERA. Based on the pilot study, a VERA percentile score of 23 or less was considered a "failure" (i.e., indicative of visual skills problems). Classifications of borderline (percentile greater than 23 and less than 62) and pass (percentile greater than or equal to 62) were combined for analysis. For the clinical skills testing, pass and fail criteria for each test are listed in Table 1.

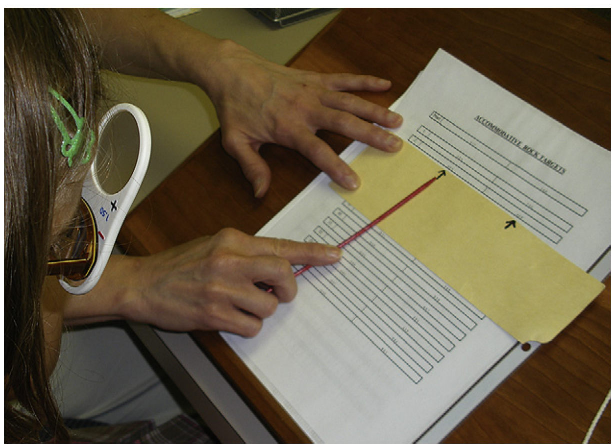

Figure 4 Accommodative facility testing.

An overall clinical visual skills failure was considered to be failure of 2 or more of the individual tests.

Table 2 lists the frequency of visual skills passes and failures versus VERA passes and failures. Using our definitions, a "true-positive" would be a child with visual skills problems diagnosed on the clinical testing whose VERA percentile score was 23 or lower. Similarly, a "true-negative" would be a child with no visual skills problems and a percentile score of 23 or higher. The sensitivity of VERA in detecting a visual skills problem was 45%, and the specificity of VERA was 83%. A similar analysis was done, changing the definition of visual skills failure to failing 3 or more tests, and the outcome was virtually identical. Excluding the DEM and relying on just 6 clinical tests produced lower sensitivity and specificity than using all 7 tests.

Because the VERA is hypothesized to detect the presence of learning-related vision problems, a separate analysis was done with a group of children who scored less than the 30th percentile on either Woodcock-Johnson word recognition or fluency and who scored >16 on the CISS, which was the cutoff for symptoms used in the Convergence Insufficiency Treatment Trial.[61] In this smaller group ($N = 30$), sensitivity improved to 56%, and specificity to 92% (*see* Table 2).

The VERA Classroom Behavior Survey includes a range of behaviors that may indicate the presence of a learning-related vision problem. One point is given for each behavior noted, and the range is 1 through 30. When children scored ≥ 8 on the VERA survey, the sensitivity of VERA to detect visual skill problems was 64% with specificity of 100% ($N = 28$; *see* Table 2).

Discussion

A vision screening needs to be simple, fast, valid, and effective,[6,41] as well as safe and acceptable.[43] The most important initial consideration is the validity of the screening; validity is assessed through sensitivity and specificity.[41] In this study, sensitivity is the percentage of children with visual skill problems that are correctly detected by VERA (true-positives or correct referrals). Sensitivity was fair at only 45%, but increased to 56% and 64% in smaller groups of children with overlays of reading delays, symptoms, and classroom behaviors. Thus, VERA had an underreferral (or false-negative) rate of 36% to 55% for visual skill problems. Specificity is the percentage of children correctly identified by VERA as not having visual skills problems (true-negatives or correct nonreferrals). Specificity was considerably better than sensitivity, at 83%, which increased to 92% and 100% in the smaller groups. Thus, the overreferral (or false-positive) rate ranged from 0% to 17%. A high specificity is desirable for screening tests that seek to confirm "disease" because the number of false-positive results is reduced in such tests.

The current data with VERA did not match the sensitivity achieved in the study by Hatch[55] with a previous version of VERA. He found sensitivity of 75% and specificity of 93%. The most likely reason for this discrepancy is the inclusion of refractive and acuity data in that study. Our study excluded children with less than 20/25 visual acuity, or failure of a hyperopia screening test, so as to address only the vision skills protocol. It could be argued that more true-positive results would be detected if acuity and refractive data were compared, which would result in higher sensitivity. Hatch's study does not state the number of subjects who failed for acuity/refractive reasons or for functional/vision skills reasons, but a study by Krumholtz[62] suggests that large numbers of acuity/refractive screening failures occur in large-scale screenings that also include vision skill measures.

Ideally, a higher number of children with visual skill problems would be identified, but VERA is designed to minimize over referrals.[63] Excessive overreferrals have the potential to create dissatisfaction among parents as well as community eye care providers and could result in increased pressure on schools to discontinue this type of screening.[41] At a specificity of 83% to 100%, VERA appears to meet the goal of minimizing overreferrals.

A potential problem with VERA is that the sensitivity is only in the range of 45% to 64%, which means that with the current protocol, roughly one third to one half of children with vision skill problems would be missed with VERA. It could be argued, however, that detecting even 50% of these

Table 2 Visual skill outcomes compared with VERA outcomes

	Clinical test classification					
	Fail		Pass			
Sample	# TP	# FN	# FP	# TN	Sensitivity = TP/(TP+FN)	Specificity = TN/(TN+FP)
All subjects	37	45	12	60	45.1%	83.3%
Symptomatic with reading delay*	10	8	1	11	55.6%	91.7%
High VERA classroom behavior survey†	14	8	0	5	63.6%	100.0%

VERA = visual efficiency rating; TP = true-positives; FN = false-negatives; FP = false-positives; TN = true-negatives.
* Symptomatic subjects (CISS ≥ 16) with a reading delay ($<$30th percentile on either word recognition or fluency).
† Subjects scoring ≥ 8 on VERA Classroom Behavior Survey.

problems in a school setting is far better than the current common practice of reliance on Snellen testing alone. Given the estimated prevalence of vision skill problems of 15% to 20% in the school-age population, there are still very large numbers of children who could potentially benefit from detection and treatment of visual skills problems. A review of school vision screenings by Mozlin[43] notes that functional screening tests have higher referral rates than the Modified Clinical Technique or Snellen testing but cautions that the optometric community must be prepared for the increased diagnostic and therapeutic demands that these additional referrals would create.

VERA Visual Skills is not designed to be used in isolation. The manual advises testing of children that show both unexplained reduced academic performance and classroom behavioral signs of a vision problem.[63] When overlays of reading performance, symptoms, and classroom behaviors are used, both the sensitivity and specificity of VERA increase. These data support the idea that VERA is more accurate among the target population of underachieving children, as the manual suggests, and also suggests that the CISS may have value as part of school screening. A recent study found that the CISS had sensitivity and specificity of 61% in detecting other visual skill problems besides just convergence insufficiency.[64]

In evaluating the effectiveness of VERA, it is useful to compare it with other screening batteries. Snellen screenings will miss virtually all visual skill problems, as visual acuity is generally not affected.[48] This same study found that Snellen in isolation missed 75% of a wider range of vision problems when compared with a complete vision examination.[48]

The MCT includes visual acuity, retinoscopy, direct ophthalmoscopy, and cover testing, and the Orinda study showed that the MCT had excellent sensitivity and specificity in detecting acuity and refractive problems.[7,43] However, it has been criticized for its limited assessment of visual skill problems that can affect learning, and significant optometric involvement is necessary for administration of the MCT.[48]

The only battery that has been developed that screens more comprehensively for visual skill problems is the NYSOA battery, which screens for accommodative, binocular, visual motor, and ocular motor problems.[48] The validation study of the NYSOA battery, however, did not use the accommodative or visual motor data in the analysis. When compared with visual examination data, the NYSOA had sensitivity of 72% and specificity of 65%. The results of VERA are roughly comparable, with greater specificity but lower sensitivity. The main advantage of VERA compared with the NYSOA is that the NYSOA requires a group of trained lay screeners and a significant amount of professional oversight. VERA by comparison can be done quite simply by a school nurse or assistant. Once the basic visual screening is done (2 to 3 minutes per child), the visual skills portion takes 10 to 12 minutes to complete for each child. It would probably not be practical or necessary to use the visual skills module on all students in a school, but it would be quite efficient to include as part of a school's evaluation of children with learning problems or chronic behaviors suggestive of a visual skills problem. Thus, schools would have "in-house" control over screening without the need for outside assistance, which is a barrier to more complex vision screening protocols.[43,55]

Regarding clinical use of VERA, the manual recommends referral of children who fail the vision skills testing (composite score <23rd percentile), are underperforming in school, and who demonstrate classroom behaviors suggestive of a vision skills problem. The program includes a borderline category of children who score from the 24th to the 61st percentile. It is recommended that children who score in the borderline range be retested at a later date, or referral considered if they also meet the criteria of school difficulty and classroom behaviors.

Conclusion

There is a need for a valid, easily administered school vision screening protocol that detects visual skill problems that interfere with reading and school performance. The VERA visual skills screener has fair sensitivity for detecting visual skills problems. When combined with a symptom survey, reading level, and a classroom behavior survey, sensitivity improves. Specificity of the screening is very good. The ease of administration and the ability of the screening to be utilized without outside help suggest that VERA has the potential to be a significant improvement over current school vision screening protocols. Given that the majority of vision skills deficits currently go undetected, VERA can be considered a reasonably effective method of in-school screening for combined binocular, accommodative, and ocular motor problems.

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