Nowadays, a proportion of a near work is increasing at schools. Therefore, it is important to understand whether complaints appearing during near work could be related to visual (accommodation or binocular vision) problems. If complaints are related to binocular vision problems, it would be important to assess the vergence system functions. One part of vergence assessment includes fusion reserves and vergence facility. Fusion reserves are describing vergence amplitude, but vergence facility reflects the vergence dynamics. Therefore, we tested computerized tests for vergence performance evaluation, which could be useful for screening at schools, and compared them with classical methods (prism bar for fusion reserves and 12 pd BO/3 pd BI flipper for vergence facility).5,6

Vergence facility

Method: Stimulus (observed through red-blue glasses) and the sequence of the stimulus presentation used in computerized tests based on random dot principle (RDS, 4 pd BO 3 pd BI, number perceived) and Transangles (5 pd BO 3 pd BI, one fused circle perceived). Subjects (90 pupils, age 7-19 y) had to give the response during 10 s or the stimulus is switched to opposite.

Results: the group’s mean values of the classical method and both computerized tests were statistically different (t-test: p < 0.01). There was weak correlation between individual measurements. It was easier for subjects to perform classical method or RDS neither to fuse transangles.

Fusion reserves

Method: Stimulus (observed through red-blue glasses) and the sequence of the stimulus presentation used in computerized tests based on random dot principle (RDS, bar perceived) and Transangles (fused circle perceived). Subjects (114 pupils, age 7-19 y) had to give the response as soon as fusion breaks. Stimulus velocity – 200 mm/min. The maximum value – 345.

Results: the group’s mean values of the classical method and both computerized tests (except PFR measured with RDS) were statistically different (t-test: p < 0.01). There were weak correlation between individual measurements (RDS: rPFR = 0.24; rNFR = -0.05, Transangles: rPFR = 0.27, rNFR = 0.09). It was easier for subjects to perform classical method or RDS neither to fuse transangles.

Evaluation of screening tests and programs:7

<table>
<thead>
<tr>
<th>Test</th>
<th>Criterion</th>
<th>Validity</th>
<th>Reliability</th>
<th>Yield</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Vergence facility</td>
<td>RDS</td>
<td>+</td>
<td>±</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Tranangles</td>
<td>–</td>
<td>–</td>
<td>±</td>
<td>+</td>
</tr>
<tr>
<td>Fusion reserves</td>
<td>RDS</td>
<td>±</td>
<td>±</td>
<td>±</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Tranangles</td>
<td>–</td>
<td>±</td>
<td>–</td>
<td>+</td>
</tr>
</tbody>
</table>

Conclusions

Tests for vergence facility and fusion reserve evaluation based on Random-dot stereogram method most of all corresponded to the criterion for screening. Technical changes (changes in disparities for vergence facility and control symbols – dynamic markers8 for fusion reserves) should be made to improve criterion “reliability of the method” and to make it possible to use these two methods in vision screening.

Additional experiments are necessary to determine what vergence performance testing is more appropriate for visual problem diagnostic (asymptomatic and symptomatic participants) and define appropriate norms for computerized tests useful for screening at schools.

Reference


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