Two Alternate Refraction Methods That Use a Scheiner’s Disc and Stenopaic Slit

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Introduction

Subjective refraction procedures using a Jackson Cross Cylinder and blur interpretation are well established, but little known and rarely used alternatives exist. Our purpose was to assess two alternate methods for possible advantages relative to traditional subjective refraction.

Methods

- Method₁ used a simple stenopaic slit to find the astigmatic axis then a Scheiner’s disc to measure the refractive powers in each meridian.
- Method₂ used a modified Scheiner’s disc overlaid with Fresnel prisms to measure power in each meridian after axis determination as done in Method₁.
- Both methods measured separate samples of 20 eyes.
- Mean power vector magnitude and visual acuity were compared for both methods and standard subjective refraction (ICC₁, ICC₂)

Theory

FIGURES: Scheiner’s disc principle depicted (above). Method₂ prism dissociation principle depicted (below)

Results

<table>
<thead>
<tr>
<th></th>
<th>logMAR VA</th>
<th>Snellen VA</th>
<th>Wilcoxon test p</th>
<th>Letters worse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard JCC₁</td>
<td>-0.14 ±0.11</td>
<td>20/14.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method₁</td>
<td>-0.10 ±0.15</td>
<td>20/16.0</td>
<td>0.426</td>
<td>1.9</td>
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<tr>
<td>Standard JCC₂</td>
<td>-0.09 ±0.10</td>
<td>20/16.1</td>
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</tr>
<tr>
<td>Method₂</td>
<td>+0.18 ±0.39</td>
<td>20/30.3</td>
<td>0.003</td>
<td>13.7</td>
</tr>
</tbody>
</table>

Method₁ vs Standard JCC₁ (mean of 20)
- Method₁ refraction: -0.48 - 0.44 x 174.3
- Standard JCC₁ refraction: -0.46 - 0.35 x 176.6
- Axis difference: 2.3°
- Vector difference: 0.39 D

Method₂ vs Standard JCC₂ (mean of 20)
- Method₂ refraction: -3.45 - 0.76 x 168.6
- Standard JCC₂ refraction: -2.79 - 0.96 x 177.8
- Axis difference: 9.2°
- Vector difference: 1.65 D

Conclusions

Results for Method₁ indicated close agreement with standard subjective refraction, but was harder for some subjects to understand. It could be a viable alternative when standard refraction is unreliable. Method₂ showed poor agreement and significantly worse visual acuity. In its current stage of development, it is not a viable alternative to standard subjective refraction.

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