Fusional vergence measurements for eso versus exo deviations: is there a difference?

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Introduction

• The **fusion reflex** is responsible for maintaining heterophoria compensation; knowing what proportion of the total vergence amplitude is needed to compensate a deviation, is important to the clinician (Antona et al., 2008).

• In a previous study, the authors found out that **exophoric children** had reduced convergence break points when compared with orthophoric and esophoric children without symptoms (Lança & Rowe, 2016).

• The **aims** of this study were to compare angle of deviation, fusional vergence measurements and fusion reserve ratio between esophoria and exophoria.
Methods

• A cross-sectional study was performed in children with:
  – best-corrected visual acuity of 0.0 LogMAR in either eye,
  – compensated heterophoria within 10 prism dioptres (PD),
  – full ocular rotations,
  – presence of fusional vergence and
  – stereopsis (60 seconds of arc or better).

• Fusional amplitudes were compared across angle of deviation categories (2, 4, 6, 8 and 10 PD) in esophoria and exophoria.

<table>
<thead>
<tr>
<th>Heterophoria</th>
<th>Angle of deviation categories</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Esophoria</strong></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>22</td>
</tr>
<tr>
<td><strong>Exophoria</strong></td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>88</td>
</tr>
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<td>6</td>
<td>51</td>
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<tr>
<td></td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>181</td>
</tr>
</tbody>
</table>
Methods

- The **fusion reserve** ratio was calculated as:
  - compensating vergence divided by prism alternating cover test for exophoria (Sheard’s criterion) and
  - base out fusional reserve break divided by the base in for esophoria (Percival’s criteria).

- **Nonparametric analysis** was used for analyzing prism fusion bar measurements because of the unequal step changes.

- The Kruskal-Wallis test was used to compare fusional vergence measurements between esophoria and exophoria.
Results

• Two-hundred and eleven children (7.65±1.16 years) were recruited to this study.

• Exophoria was most common for near (n=181; 85.8%) and distance (n=20; 9.5%).

• Esophoria was present in 22 children for near (10.4%) and in 1 child for distance (0.5%).

• No significant differences were found between fusional amplitudes and angle of deviation for near across categories in esophoria and exophoria (p>0.05).
Results

- Children with exophoria of 10PD had a slight but **no significant** \((p=0.264)\) increase in mean fusional convergence \((26.67)\) for near compared with 2PD \((19.95)\).

- In esophoric children the variation of mean fusional convergence was smaller from to 2P \((25.00)\) to 10PD \((22.50)\) and **non significant** \((p=0.185)\).
Results

• The mean fusion reserve ratio ranged between 2.50 (2PD) and 2.04 ± 0.06 (10PD) for esophoria and between 9.98 ± 2.55 (2PD) and 2.67 ± 0.58 (10PD) for exophoria.

• The fusion reserve ratio was significantly smaller in children with higher deviations (i.e. 10PD) for exophoria ($p<0.001$).
Conclusions

• Angle of deviation is not an efficient measure to predict fusional amplitudes.

• The fusion reserve ratio appears to be a better measurement to assess the effect of the underlying angle of deviation on fusional convergence in exophorias.

• Limitations of this study include the number of children in each deviation category.

• More studies are necessary to better understand the relationship between fusion amplitudes and angle of deviation.
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