A pilot study of children with amblyopia treated by the gratings method

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SUMMARY A total of 6 patients, 2 with anisometropic, 2 with strabismic and anisometropic, and
2 with strabismic amblyopia treated with the ‘gratings method’ showed more than 2 lines of improve-
ment in linear visual acuity. Patient attention and interest and repeated testing of the visual acuity
were uncontrolled factors in this study. Moreover, the detailed visual tasks performed by the
amblyopic eye may in themselves be the reason for improvement. Clearly a careful study which
controls these possibilities is needed before a claim can be made that the ‘gratings’ per se offer an
improved method of treatment of amblyopia.

Great interest was aroused by the reports from
Adenbrooke’s Hospital and the Physiological
Laboratory, University of Cambridge, of a new
treatment for amblyopia.1-4 We carried out a pilot
study, without controls, of 30 children with ambly-
opia who were treated by this method. Twenty of
these patients had had a poor response to treatment
by conventional occlusion methods (group A) and
10 were previously untreated amblyopes (group B).

Patients and methods

Our study tried to follow as exactly as possible the
method described by the Cambridge group. Visual
acuity was tested at distance and near by rows and
single optotypes with the refractive error corrected.
Glasses, if needed, were worn for a minimum of 1
month before treatment was started. The initial
visual acuity was recorded by one examiner and
the final visual acuity by a different examiner who
had no knowledge of the initial response.

‘Treatment consisted of viewing an apparatus
on which any one of a range of high contrast,
sharp-edged gratings were slowly rotated at 1
revolution per minute (r.p.m.) behind a transparent
cover on which drawing games were played to
ensure the child’s attention to the stimulus’.5,6 The
nonamblyopic eye was occluded only during the
actual treatment sessions.

Each child was given 5 treatment sessions of 7 to
14 minutes, and then progress was assessed. Five
sessions were chosen because the initial reports
indicated that ‘those who respond well to this
treatment usually do so within the first two or three
treatments’.7 The longest interval between treat-
ment sessions was 2 weeks, and then only because
illness prevented 3 children from following the
weekly schedule.

Overall we studied 30 patients (17 male, 13
female) with an age range of 3 years 2 months to
9 years. Twelve patients had amblyopia of the right
eye and 18 had amblyopia of the left eye.

Results

Eight of the 30 patients gave unreliable responses
and so were excluded from the series. The remaining
22 patients included 16 (group A) who had had
previous treatment for amblyopia and 6 (group B)
who had not.

Table 1 shows the types of amblyopia treated in
each group and Tables 2 and 3 analyse the results
in group A and group B respectively.

A total of 6 patients, 2 with anisometropic, 2 with
strabismic and anisometropic, and 2 with strabismic
amblyopia treated with the gratings method showed
more than 2 lines of improvement in linear visual
acuity. Surprisingly, 4 of these patients were in
group A and 2 in group B.

Discussion

Many variables exist in testing visual acuity in
children. The reliability of responses depends on
their understanding of the test and on the amount
of interest it arouses. Better attention alone may account for several lines of improvement, as may familiarity with the test. It is hard to separate improved visual acuity from better testing conditions, increased ability to co-operate with the test, or from learning. For this reason an improved response of 2 lines or less on testing linear visual acuity was not considered adequate proof of improvement in visual acuity. It can be seen from Tables 2 and 3 that only 6 patients improved more than 2 lines with the 'gratings method', 4 in group A and 2 in group B. Two of these patients had strabismic amblyopia, 1 patient in each group. Two had strabismic and anisometropic amblyopia, both in group A. The other 2 patients had anisometric amblyopia, 1 patient in each group.

Reviewing the results of this pilot study has raised many points which require further investigation in a properly controlled series. For example, one 4-year-old child had a recurrence of strabismic and anisometric amblyopia after occlusion therapy was stopped. Gratings treatment was tried with a good response (4 lines), but within 1 month of stopping treatment the visual acuity again relapsed. We have used 15 minutes per week occlusion combined with fine visual tasks for the past month, and visual acuity is again improving. Perhaps one of the things we shall learn from the gratings method is that considerably less occlusion than previously thought (provided it is combined with fine visual tasks) is needed to maintain optimum visual acuity during the developmental period. This would be a re-emphasis of statements that have appeared for many years, including the recent papers from Cambridge.

Anisometric amblyopes were treated after they had worn their correction for at least 1 month. Could their continued improvement be due, at least in part, to improvement obtained simply by wearing their glasses?

**Conclusion**

It would appear from this pilot uncontrolled study that there are sufficient grounds for a properly controlled study to evaluate whether the gratings per se offer any advantages over conventional occlusion combined with detailed visual task work for the amblyopic eye.

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<table>
<thead>
<tr>
<th>Table 1</th>
<th>Amblyopia types and treatment</th>
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<tbody>
<tr>
<td>Types of amblyopia</td>
<td>Group A</td>
</tr>
<tr>
<td></td>
<td>Previous treatment</td>
</tr>
<tr>
<td>Strabismic (S)</td>
<td>6 (37.5%)</td>
</tr>
<tr>
<td>Strabismic + anisometropic (SA)</td>
<td>8 (50%)</td>
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<tr>
<td>Anisometropic (A)</td>
<td>2 (12-5%)</td>
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<tr>
<td>Totals</td>
<td>16</td>
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<table>
<thead>
<tr>
<th>Table 2</th>
<th>Analysis of results: group A, patients who had previous treatment</th>
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</thead>
<tbody>
<tr>
<td>Age of patient</td>
<td>Type of amblyopia</td>
</tr>
<tr>
<td>6 7/12</td>
<td>S</td>
</tr>
<tr>
<td>5 4/12</td>
<td>S</td>
</tr>
<tr>
<td>5 8/12</td>
<td>S</td>
</tr>
<tr>
<td>7 3/12</td>
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<td>8</td>
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<td>4 3/12</td>
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<td>4 2/12</td>
<td>A</td>
</tr>
<tr>
<td>9</td>
<td>A</td>
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</table>

*Improving with occlusion.

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*Treatment continuing. S = Strabismic amblyopia. SA = Strabismic + anisometropic amblyopia.

**Table 3** Analysis of results: group B, patients who had not had previous treatment

<table>
<thead>
<tr>
<th>Age of patient</th>
<th>Type of amblyopia</th>
<th>Fixation</th>
<th>Pre-treatment visual acuity</th>
<th>Post-treatment visual acuity</th>
<th>No. of lines improved</th>
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<tbody>
<tr>
<td>7 9/12</td>
<td>S</td>
<td>Central</td>
<td>6/18</td>
<td>6/9</td>
<td>3</td>
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<tr>
<td>5 10/12</td>
<td>S</td>
<td>Central</td>
<td>6/30</td>
<td>6/30</td>
<td>0</td>
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<tr>
<td>5 10/12</td>
<td>SA</td>
<td>Eccentric</td>
<td>6/60</td>
<td>6/60</td>
<td>0*</td>
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<tr>
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<td>A</td>
<td>Central</td>
<td>6/60</td>
<td>6/60</td>
<td>0</td>
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<tr>
<td>7 4/12</td>
<td>A</td>
<td>Central</td>
<td>6/15</td>
<td>6/12</td>
<td>1</td>
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<tr>
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<td>A</td>
<td>Central</td>
<td>6/18</td>
<td>6/9</td>
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the Canadian National Institute for the Blind out of the E. A. Baker Foundation for the Prevention of Blindness.

References