Correspondence

Visual analogue scales: a source of error

Sir. A visual analogue scale (VAS) is frequently used in the assessment of patients to record subjective feelings (such as pain) or opinions (such as benefit received from treatment). We have noticed that reproduction of forms containing a VAS using a photocopier has introduced distortions to the scale which may influence the readings obtained.

VAS lines of 50, 100, and 150 mm were accurately drawn vertically and horizontally, and copied 10 times on five photocopiers available at different locations within the hospital. In addition, five sequential copies (photocopying from the previous photocopy) were also made on each machine. The length of each VAS line was then accurately measured on each copy, and variations in length expressed as a percentage change. The results are shown in Table 1.

All the photocopiers tested frequently introduced changes in the VAS lines. In three the lines were increased in length, while in two they were reduced. Repeated photocopying of previously made copies (a procedure which, in our experience, is frequently followed when stocks of assessment forms are running low) compounded these distortions so that changes of up to 11% may be introduced after five copies, with the result that a standard 100 mm scale is increased to 111 mm.

Horizontal lines (in the direction in which the paper moved through the copier) were usually longer than vertical lines, suggesting two sources of distortion: some general distortion introduced by the optical system employed (which might lengthen or shorten both horizontal and vertical lines) and an elongation in horizontal lines caused by mis-matching between the rate of scanning the original and of copying it onto the paper inside the machine. In the Xerox 1075 the image is transferred in a single flash, and no additional horizontal distortion is evident, though all line lengths were reduced. Greater general reduction in the OCE 1900DF machine is counteracted in the horizontal direction by elongation, which results in only a very small overall distortion.

In view of these observations we now check our assessment forms after photocopying, and if necessary prepare an appropriately adjusted master copy which, when used in a particular machine, produces lines of the required length. We use only the master to produce further copies of the forms as required.

<p>| Table 1 Proportional change (%) in visual analogue scale length on repeated photocopying |
|---------------------------------------------|----------------------------------|------------------|------------------|------------------|------------------|</p>
<table>
<thead>
<tr>
<th>Direction of photocopying*</th>
<th>Photocopier</th>
<th>Xerox 2300</th>
<th>Xerox 1045</th>
<th>Infotec 8036</th>
<th>Xerox 1075</th>
<th>OCE 1900DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median (range) of 10 photocopies</td>
<td>Horizontal</td>
<td>2.0 (1.0-3.0)</td>
<td>1.0 (0-2.0)</td>
<td>1.0 (0-1.0)</td>
<td>0.0 (0-1.0)</td>
<td>0.0 (0-1.0)</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>1.0 (0-2.0)</td>
<td>1.0 (0-1.7)</td>
<td>0.6 (0-1.0)</td>
<td>-0.2 (0-1.6)</td>
<td>0.5 (0-1.0)</td>
</tr>
<tr>
<td>Total change after 5 sequential copies</td>
<td>Horizontal</td>
<td>11.0</td>
<td>3.7</td>
<td>3.5</td>
<td>-1.2</td>
<td>-0.7</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>5.5</td>
<td>2.9</td>
<td>2.3</td>
<td>-1.3</td>
<td>-3.1</td>
</tr>
</tbody>
</table>

*Horizontal= in the same direction as the paper moving through the machine.
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