Internet Based Measurement of Visual Expertise in Radiological Skill

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Internet Based Measurement of Visual Expertise in Radiological Skill

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Introduction

• Expert radiologists exhibit exquisite levels of detection and diagnostic accuracy from single views of radiology images.
• Trainee radiologists must develop this skill during training
• Repeated testing of trainees and testing of expert consultants is impeded by practical constraints of traditional testing methods
• New platforms allow testing to be moved online and rich data to be collected from novel testing protocols.

The Task

• Task was first developed using matlab and then implemented in Qualtrics using custom Javascript
• Participants are asked whether they think any abnormalities are present in the image (6 point scale)
• If any abnormalities are suspected, participants must click on image in location(s) of abnormality.
• Decision, Decision time, Location of clicks, time of clicks and order of clicks all recorded
• Time measure is page-load time to click
• Full library of images assessed by 12 consultant radiologists via web-link
  o Consultants recruited from across Europe
  o Consultants permitted to break and return to study throughout their participation
• Sub-set of 30 images also assessed by 41, 3rd – 5th year UoS medical students, using web-link

<table>
<thead>
<tr>
<th>Measure</th>
<th>Consultants</th>
<th>Med Students</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision Time (sec)</td>
<td>30.6 (17.0)</td>
<td>11.7 (5.6)</td>
<td>0.6</td>
</tr>
<tr>
<td>Localisation Time (sec)</td>
<td>12.2 (5.7)</td>
<td>7.2 (4.7)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Localisation Error (pix)</td>
<td>27.3 (11)</td>
<td>90.8 (44.4)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Number of Clicks</td>
<td>2 (0.4)</td>
<td>1.8 (1)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Results

• Consultants (experts) are far more accurate in identifying abnormalities, and far more precise in locating them than med-students (skilled novices)
  • This is in line with previous literature
• Consultants took longer than med-students to make decision
  • This is contrary to previous literature
• Web-based measures can produce valid measurements of cognitive abilities in special populations on real-world tasks