Internet Based Measurement of Visual Expertise in Radiological Skill

THIRKETTLE, Martin <http://orcid.org/0000-0002-6200-3130>, STAFFORD, Tom and OFFIAH, Amaka

Available from Sheffield Hallam University Research Archive (SHURA) at:
http://shura.shu.ac.uk/22972/

This document is the author deposited version. You are advised to consult the publisher's version if you wish to cite from it.

Published version


Copyright and re-use policy

See http://shura.shu.ac.uk/information.html
Internet Based Measurement of Visual Expertise in Radiological Skill

Martin Thirkettle¹, Tom Stafford², Amaka Offiah³

¹ martin.thirkettle@open.ac.uk, Department of Psychology, The Open University, UK,
² t.stafford@sheffield.ac.uk, Department of Psychology, University of Sheffield, UK
³ a.offiah@sheffield.ac.uk, Academic Unit of Child Health, Sheffield Children’s NHS Foundation Trust, UK

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.
  - Consultants recruited from across Europe.
  - 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.

The Image Library
• 134 paediatric musculoskeletal radiographs.
• Selected from 3,000 over a 6-year period (2008 to 2013).
• Interpreted by Consultant paediatric radiologist & student.
  - Interpretation made with clinical report.
  - Reference judgement and locations recorded.
• Classified as:
  - Easy (45); Intermediate (46); Difficult (43).
  - 16 abnormality free images included.

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.

<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>

Click to locate the abnormality(ies):