Internet Based Measurement of Visual Expertise in Radiological Skill

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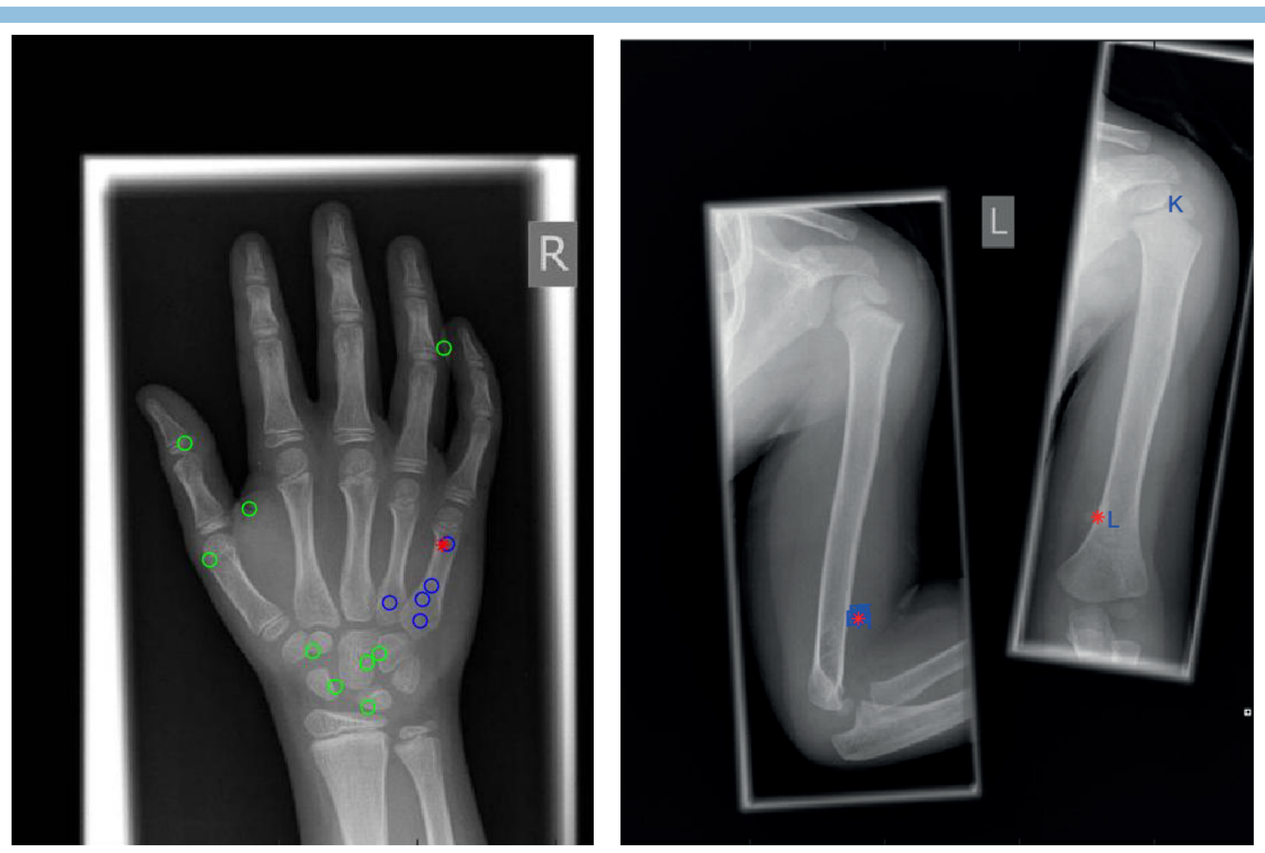
Introduction

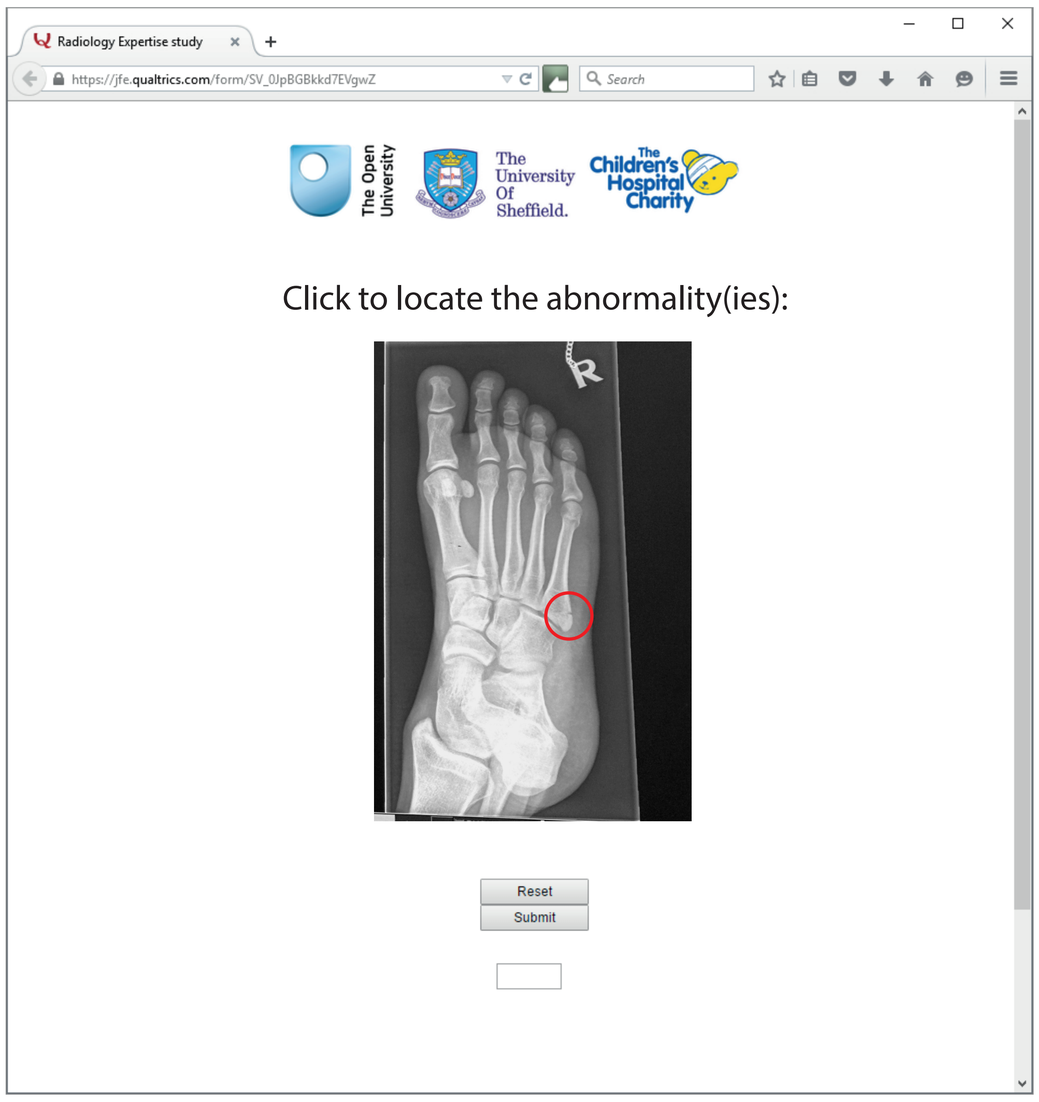
- Expert radiologists exhibit exquisite levels of detection and diagnostic accuracy from single views of radiology images.
- Trainee radiologists must develop this skill during training
- Repeated testing of trainees and testing of expert consultants is impeeded by practical constraints of traditional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



The Task

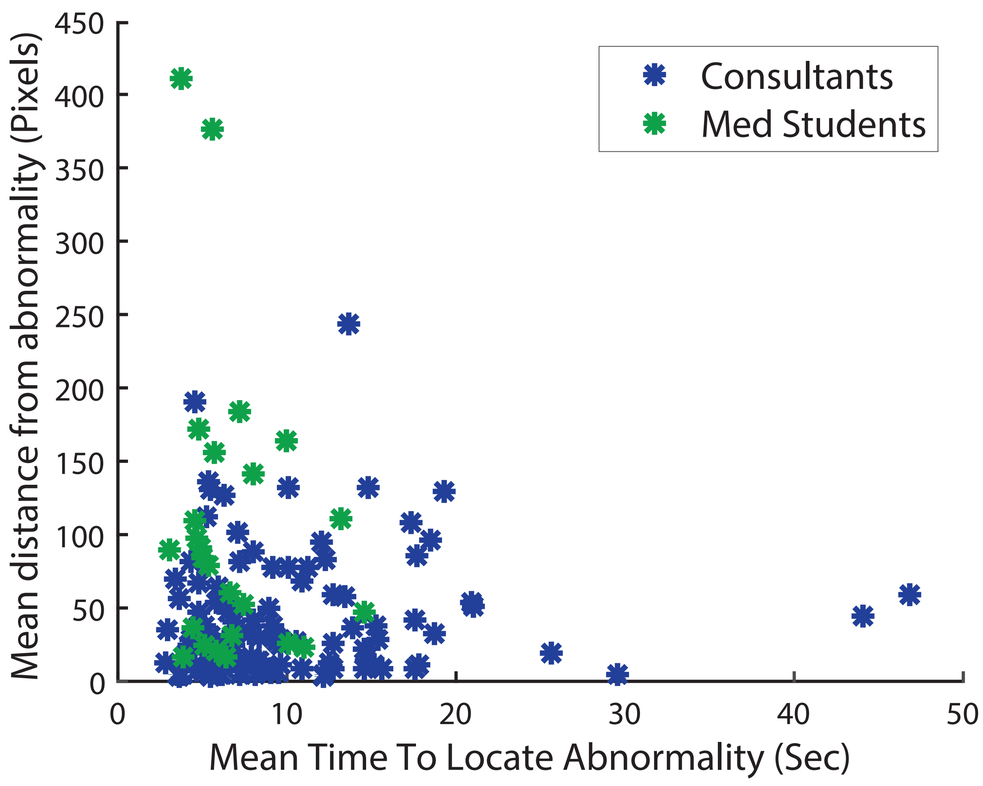
- Task was first developed using matlab and then implemented in Qualtrics using custom Javascript
- Participants are asked whether they think any abnormalities are present in the image (6 point scale)
- If any abnormalities are suspected, participants must click on image in location(s) of abnormality.
- 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

Measure	Consultants	Med Students	*p Value*
Decision Time (sec)	30.6 (17.0)	11.7 (5.6)	0.6
Localisation Time (sec)	12.2 (5.7)	7.2 (4.7)	<0.01
Localisation Error (pix)	27.3 (11)	90.8 (44.4)	<0.01
Number of Clicks	2 (0.4)	1.8 (1)	<0.001



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
  - o Interpretation made with clinical report
  - o Reference judgement and locations recorded
- Classified as
  - o Easy (45); Intermediate (46); Difficult (43)
  - o 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