

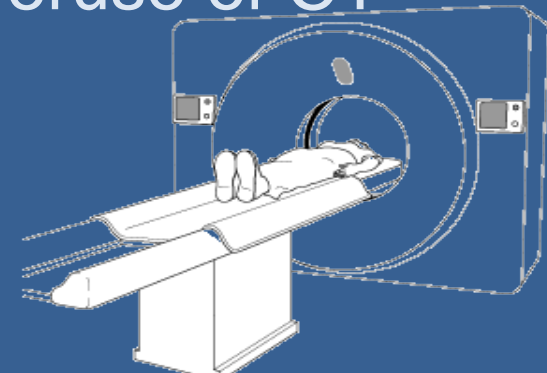
Exploring CT dose optimisation; a longitudinal study of pre- to post-registration radiographers.

By

Victoria Major

Introduction

- In CT scanning, patients should receive the optimal level of radiation to achieve a clinically diagnostic scan¹.
- CT makes a disproportionate contribution to the radiation exposure of patients compared with other radiation-based imaging techniques².
- The number of CT scans is likely to increase 100% in the next five years³. There is an overuse of CT scans⁴.



Cancer

Cancer fears prompt call to cut hospitals' CT scan radiation levels

Risk is 'low', but one in 2,000 will develop a new cancer after an abdominal scan, warns government advisory body



Nursing staff prepare a CT scanner. Comare says radiation exposure from the machines has to be set against the benefit of accurate patient diagnosis. Photograph: Christopher Furlong/Getty Images

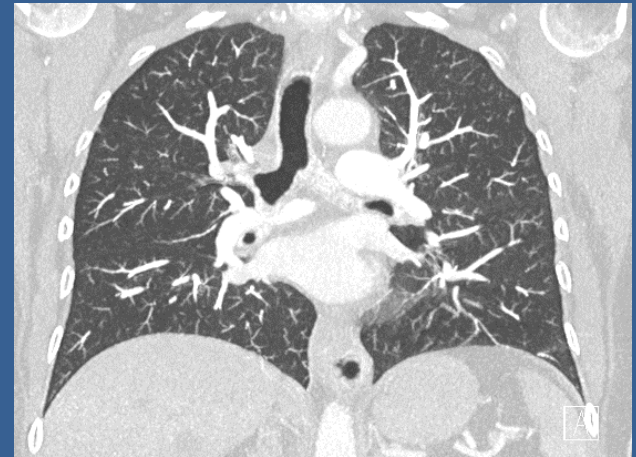
Sarah Recaney, health editor

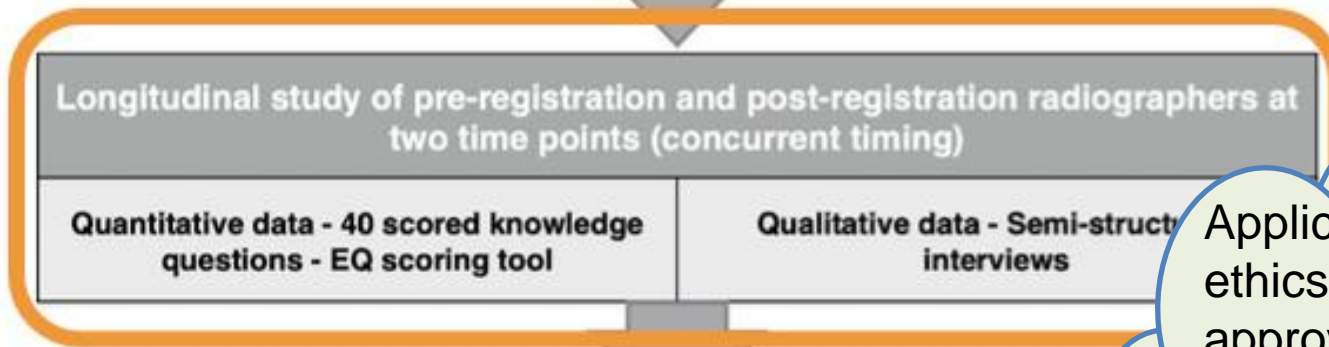
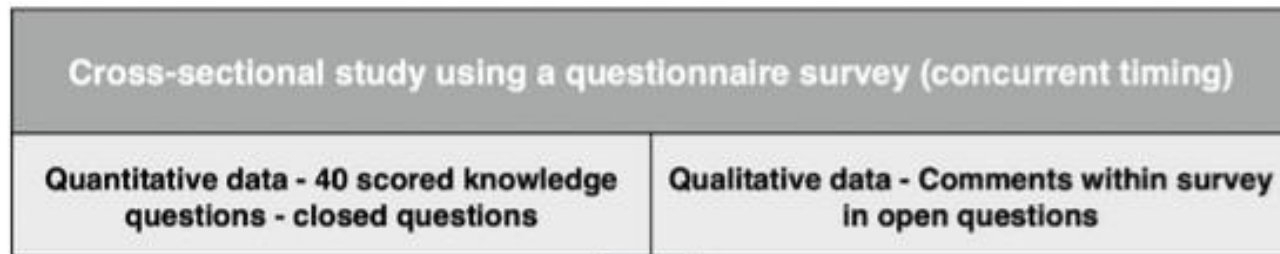
Modern machines have settings that can very precisely adjust the radiation dose, so that it is at the optimal level for the individual.

Hospitals must; ensure their staff are trained to adjust them properly⁵.

International

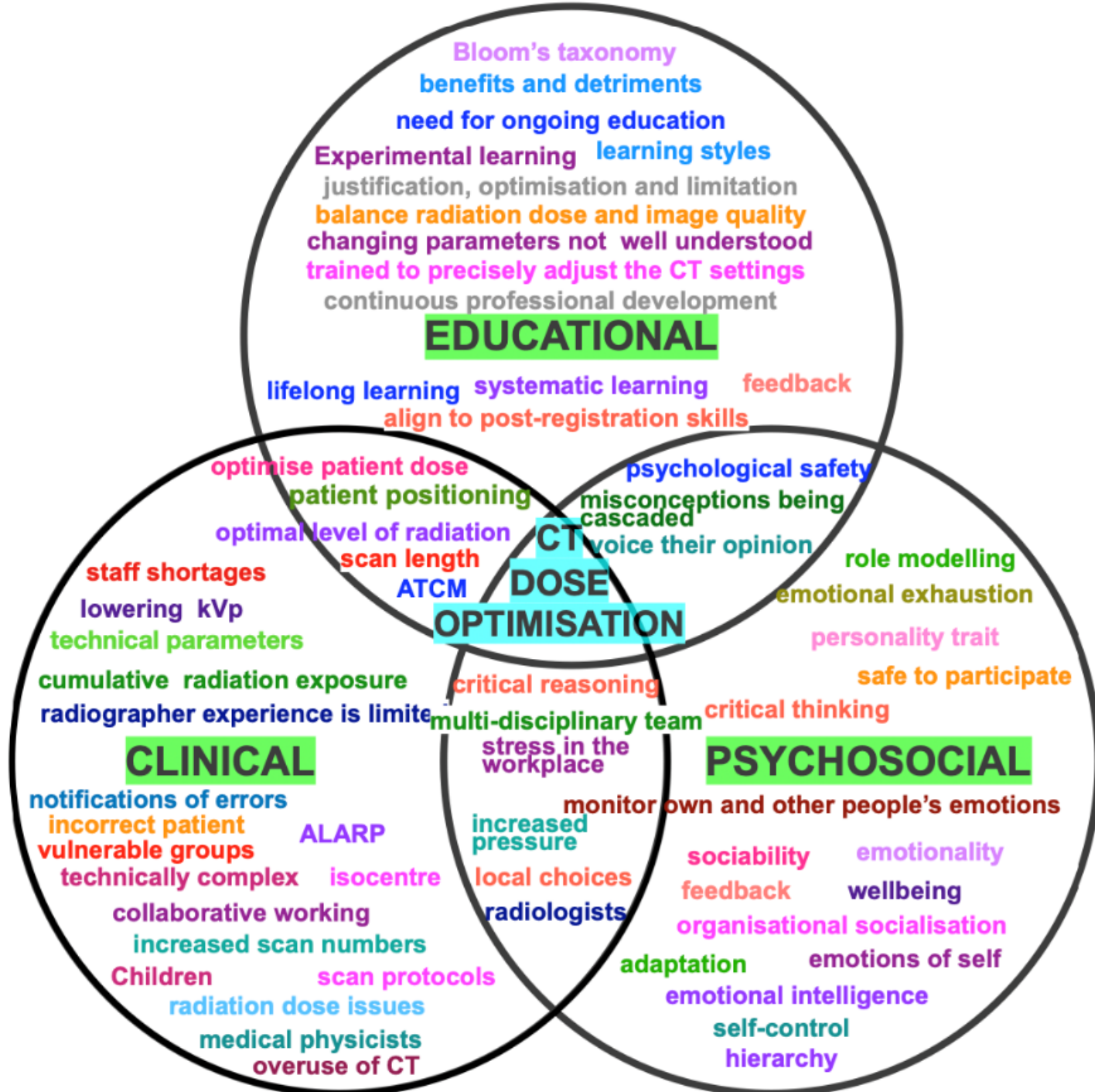
- Smith-Bindman (2019) concluded that the variation in CT doses across countries were primarily attributable to local choices regarding technical parameters⁶.





Application for ethics was approved by the University of Hertfordshire Ethics Committee with delegated authority (aHSK/UH/02331)

Longitudinal study



Aim

- We aimed to identify training requirements for UK CT radiographers, regarding specifically social and educational factors, and whether these have an influence on the longitudinal approach toward CT dose optimisation.



Mixed Methods Approach

- Qualitative :- In-depth interviews
- Quantitative :-
 - CT exposure parameters questionnaire⁷
 - Emotional intelligence questionnaire⁸

Questionnaire (UK)

1) Routine CT scanning parameters (kVp, mA, slice thickness, pitch, and reconstruction algorithm) should be changed according to which of the following

	True	False
Patient size		
Anatomical region		
Study indication		
Patient age		

2) Regarding Automated Tube Current Modulation (ATCM)

	True	False
ATCM has been shown to decrease patient dose on average		
ATCM can increase the patient dose in the pelvic region		
ATCM should not be used in the presence of metallic implants		
ATCM is affected by centering of the patient within the gantry		

3) Regarding the noise index (Noise index: GE /Standard deviation: Toshiba /Effective mAs: Siemens + Philips)

	True	False
The non-contrast phase of an abdomen scan requires the same noise setting (i.e. mAs setting) as the contrast phase		
Readers/reporters can tolerate less noise with obese patients		
Readers/reporters can tolerate more noise with paediatrics		
The noise index should be changed when changes in the patient size are extreme		

4) Increasing the peak beam energy (kVp) from 120-140 kVp causes an increase in CTDI values of

17% □ 38% □ 65% □ 89% □

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TEIQue-SF

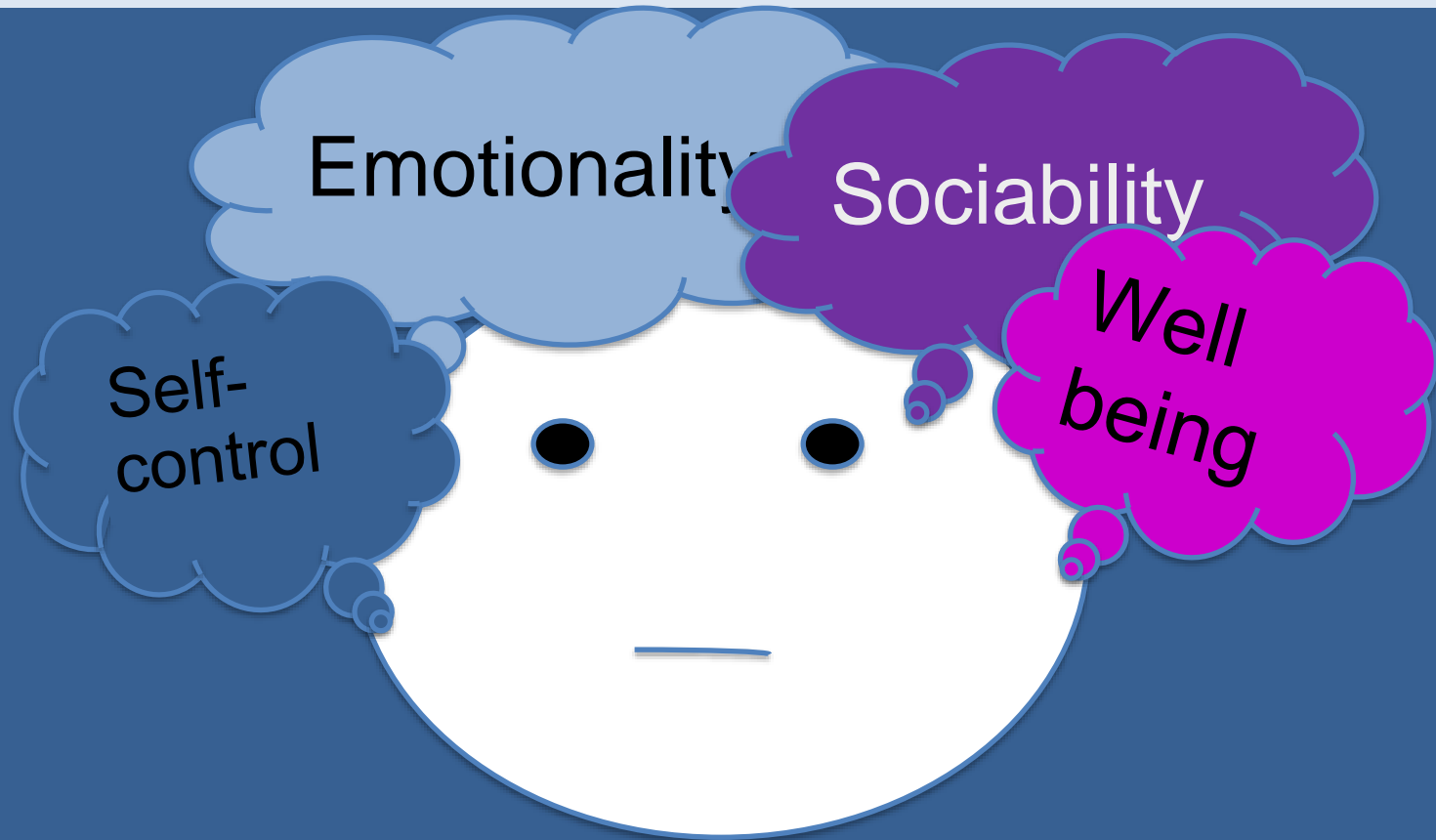
Instructions: Please answer each statement below by putting a circle around the number that best reflects your degree of agreement or disagreement with that statement. Do not think too long about the exact meaning of the statements. Work quickly and try to answer as accurately as possible. There are no right or wrong answers. There are seven possible responses to each statement ranging from 'Completely Disagree' (number 1) to 'Completely Agree' (number 7).

1.....2.....3.....4.....5.....6.....7
Completely Disagree Completely Agree

1. Expressing my emotions with words is not a problem for me.	1	2	3	4	5	6	7
2. I often find it difficult to see things from another person's viewpoint.	1	2	3	4	5	6	7
3. On the whole, I'm a highly motivated person.	1	2	3	4	5	6	7
4. I usually find it difficult to regulate my emotions.	1	2	3	4	5	6	7
5. I generally don't find life enjoyable.	1	2	3	4	5	6	7
6. I can deal effectively with people.	1	2	3	4	5	6	7
7. I tend to change my mind frequently.	1	2	3	4	5	6	7
8. Many times, I can't figure out what emotion I'm feeling.	1	2	3	4	5	6	7
9. I feel that I have a number of good qualities.	1	2	3	4	5	6	7
10. I often find it difficult to stand up for my rights.	1	2	3	4	5	6	7
11. I'm usually able to influence the way other people feel.	1	2	3	4	5	6	7
12. On the whole, I have a gloomy perspective on most things.	1	2	3	4	5	6	7
13. These close to me often complain that I don't trust them right.	1	2	3	4	5	6	7
14. I often find it difficult to adjust my life according to the circumstances.	1	2	3	4	5	6	7
15. On the whole, I'm able to deal with stress.	1	2	3	4	5	6	7
16. I often find it difficult to show my affection to those close to me.	1	2	3	4	5	6	7
17. I'm normally able to "get into someone's shoes" and experience their emotions.	1	2	3	4	5	6	7
18. I normally find it difficult to keep myself motivated.	1	2	3	4	5	6	7
19. I'm usually able to find ways to control my emotions when I want to.	1	2	3	4	5	6	7
20. On the whole, I'm pleased with my life.	1	2	3	4	5	6	7
21. I would describe myself as a good negotiator.	1	2	3	4	5	6	7
22. I tend to get involved in things I later wish I could get out of.	1	2	3	4	5	6	7
23. I often pause and think about my feelings.	1	2	3	4	5	6	7
24. I believe I'm full of personal strengths.	1	2	3	4	5	6	7
25. I tend to "back down" even if I know I'm right.	1	2	3	4	5	6	7
26. I don't seem to have any power at all over other people's feelings.	1	2	3	4	5	6	7
27. I generally believe that things will work out fine in my life.	1	2	3	4	5	6	7
28. I find it difficult to bond well even with those close to me.	1	2	3	4	5	6	7
29. Generally, I'm able to adapt to new environments.	1	2	3	4	5	6	7
30. Others admire me for being relaxed.	1	2	3	4	5	6	7

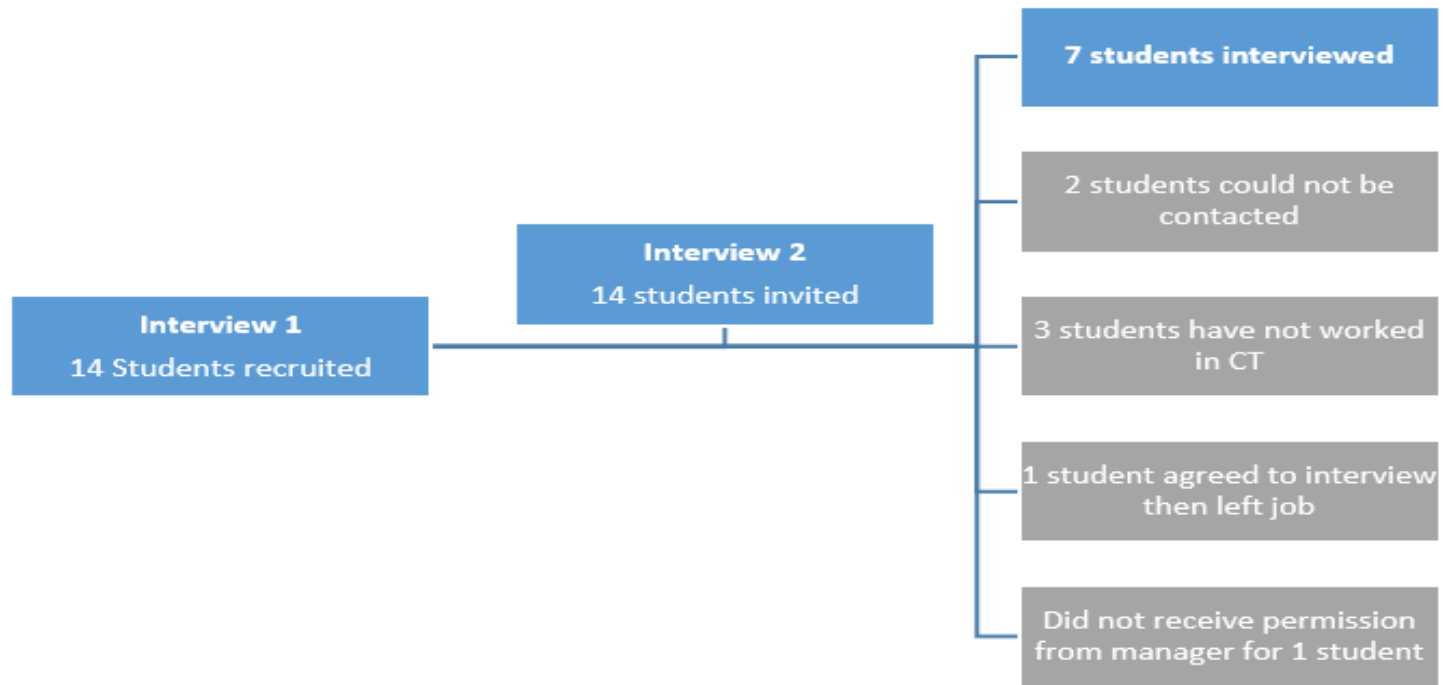
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Emotional Intelligence (EI or EQ)



Trait Emotional Intelligence Questionnaire-Short Form (TEIQue) ⁸
Measures; Well being, Self-control, Emotionality and Sociability & Global EQ

Recruitment



Results

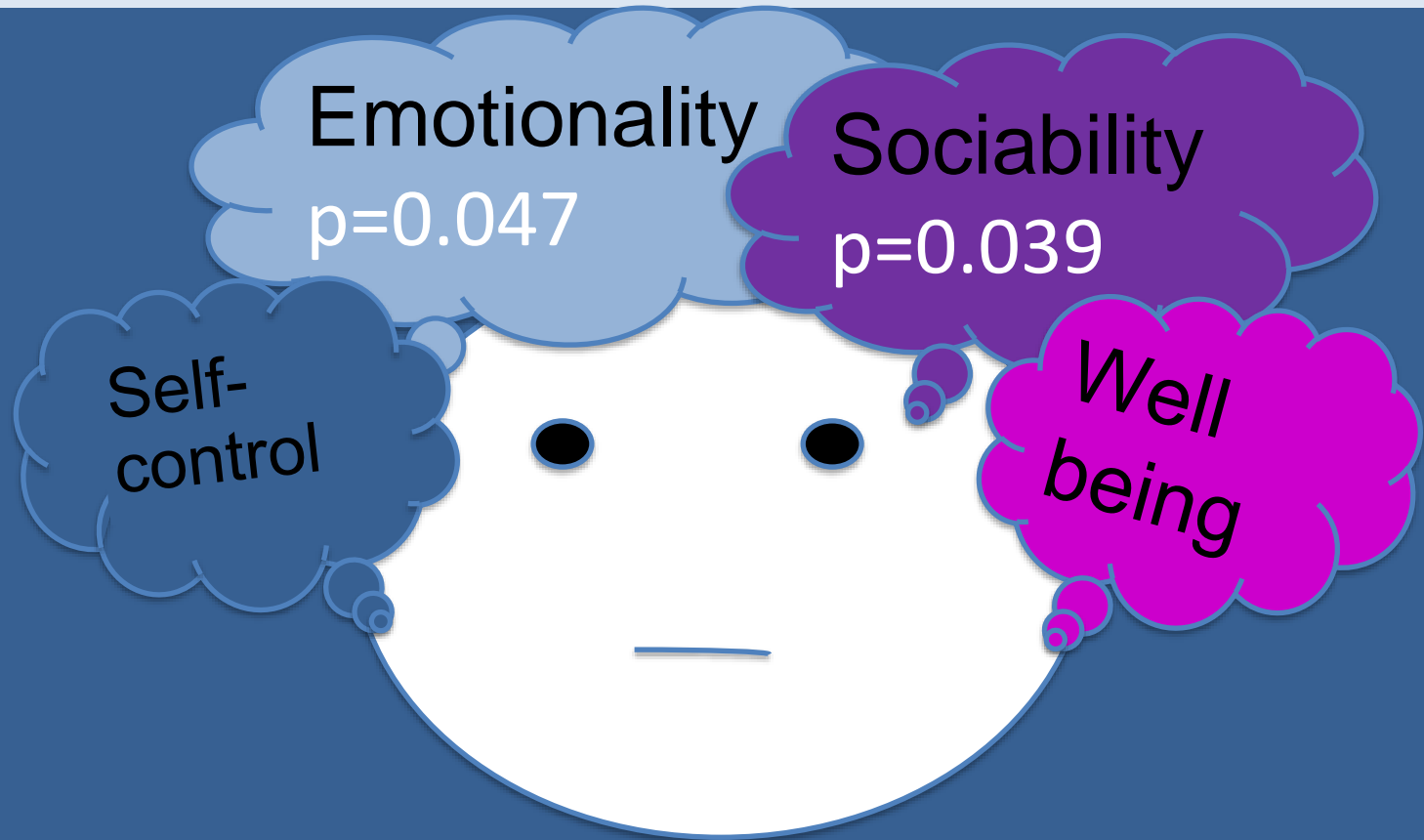
- Analysed via descriptive statistics and thematic analysis
- Thematic analysis framework was the Braun and Clarke's six step model⁹ :-
 1. *Model familiarisation and writing familiarisation notes*
 2. *Systematic data coding*
 3. *Generating initial themes from coded and collated data*
 4. *Developing and reviewing themes*
 5. *Refining, defining and naming themes*
 6. *Writing the report*

40 question CT exposure parameter questionnaire⁷

Profession	Mean	SD	Min	Max
UK radiographers	29	3.7	23	36
Pre-registration	24	4.5	16	31
Post-registration	29	3.4	27	35

Knowledge of CT exposure parameters increased, with a difference in mean scores pre- and post-qualification ($P= 0.0085$).

Emotional Intelligence (EI or EQ)

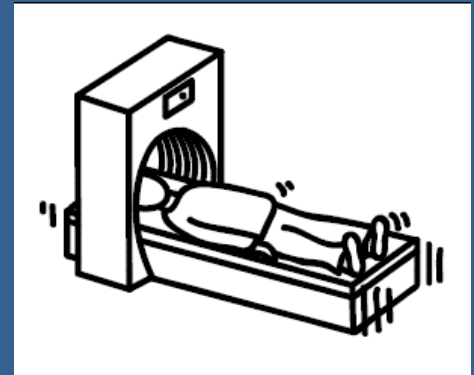


Global emotional intelligence did not change significantly over time (5.13 to 5.43)

Global emotional intelligence was not significantly different from a UK national survey
5.35¹⁰

Themes

- Three main themes were identified:-
 - Education
 - Dose optimisation and
 - Culture



Pre-registration

Mentoring

Learn local protocols

Undergraduate

Physics training

Basic positioning

With CT scanner

Get to know how the machine works

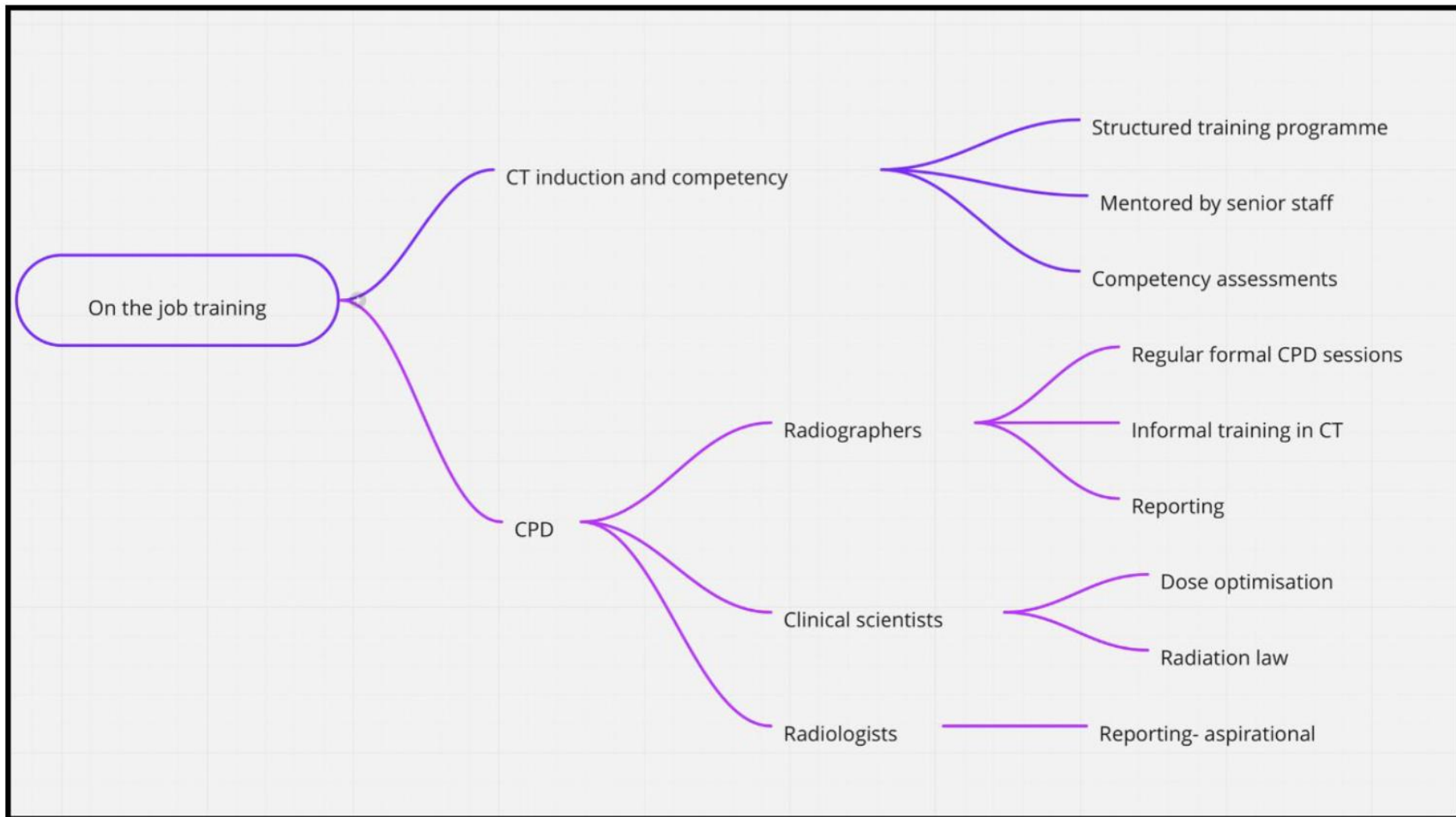
No scanner available at uni

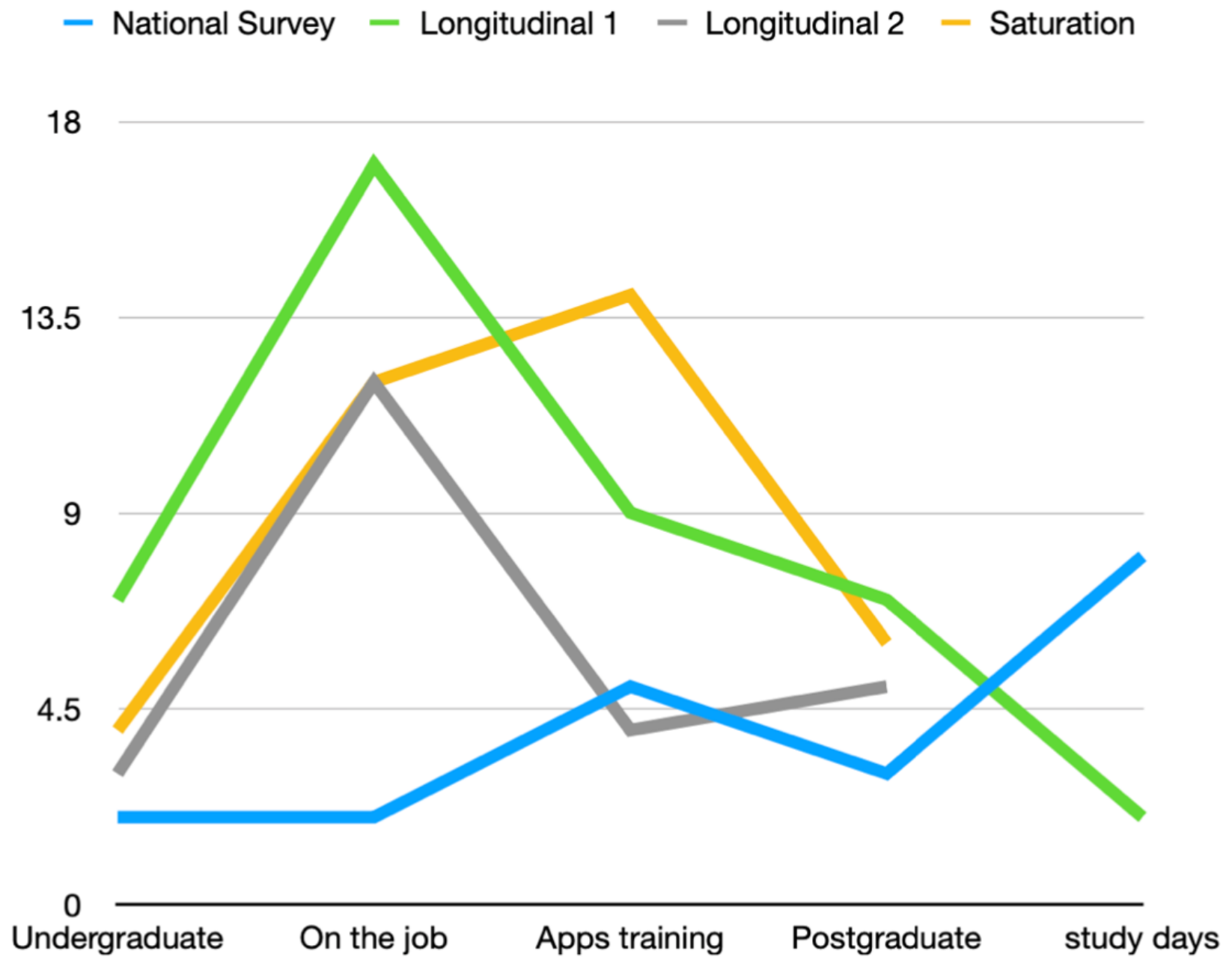
Out of date if not used after graduation

Practical training

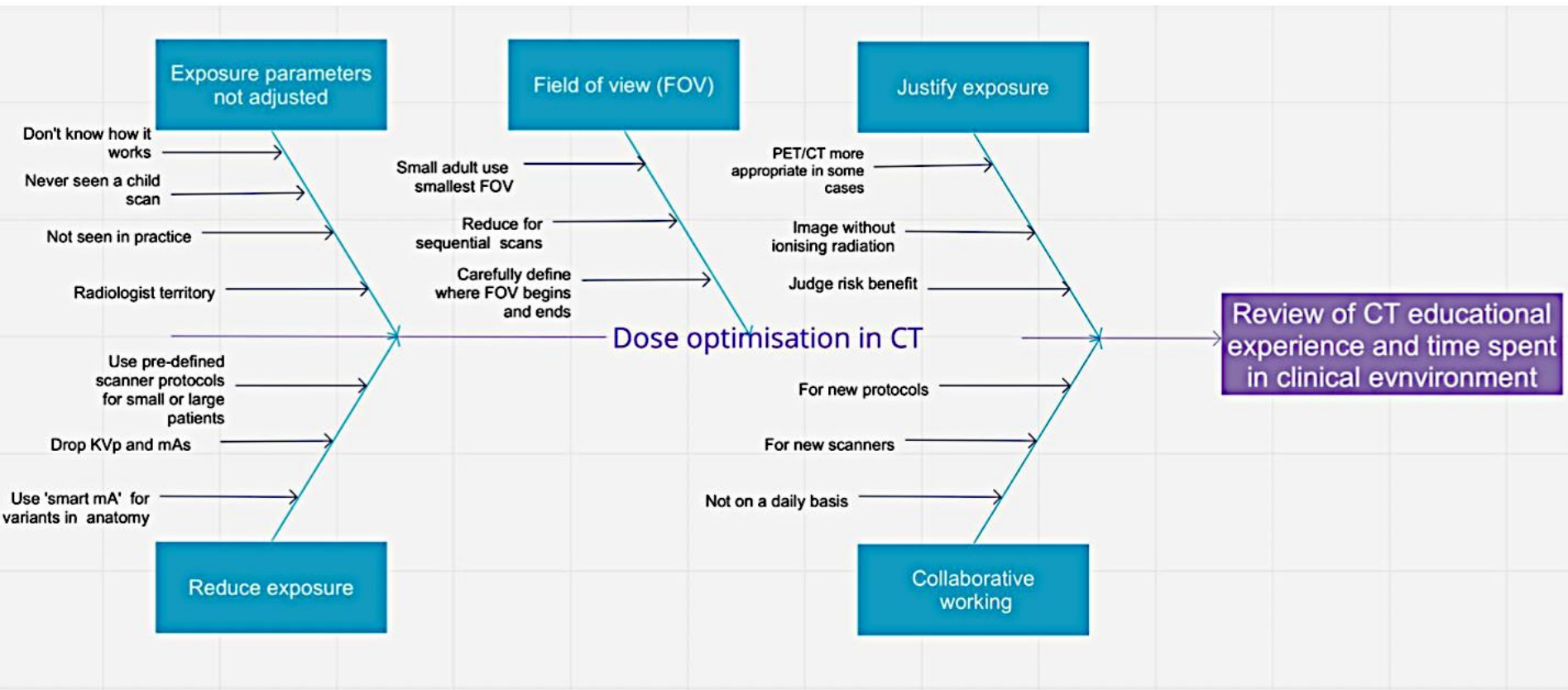
Learn on different types of scanners

Post-registration





Pre-registration



Post-registration



Radiographer's comments

Pre-registration

"Never seen a child scanned"
UG8

Child scan

".....for new scanner not on a daily basis"
UG2

Collaborative working

Post-registration

"Paediatric protocol...I haven't seen it but I'm guessing there must be one." PG6

"CT dose tutorials with the medical physicist there, but not the radiologist"
PG5

Culture

Sub-themes

Pre-registration	Post-registration
Passive role	Active role
Team working	Team working
Asking questions	Nurture
Explanation of protocols	Autonomous practitioner
	Negativity

“.....students just helping patients getting on and off the table.” *UG3*

Culture

“From the first day we are involved in everything” *PG10*

Conclusions

- Learning in the clinical environment is complex
- There is an urgent requirement for professional education to keep pace with technological advances in CT scanning
- Effective teaching and training in the clinical environment is an essential investment for the future workforce
- CT radiographers should be offered frequent and bespoke training, with a multi-disciplinary approach

References

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Thank you for listening

Any questions?