

Emotional Intelligence development in radiography curricula: Results of an international  
longitudinal study

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## Abstract

This paper presents the findings from the first three years of a longitudinal study following a cohort of radiography and radiotherapy students through their qualification programmes. The aim was to demonstrate any changes in emotional intelligence I and to clarify the timing of any changes.

## Methods

This was an international, longitudinal cohort study of student radiographers undertaking pre-registration programmes at four different higher education institutions. It was a survey design using a published and validated trait EI questionnaire. A repeated measures (mixed) ANOVA (Greenhouse-Geissler methods) was employed with age and gender included in the models, as these were considered possible confounding factors. Sensitivity analysis was also applied since responses gradually reduced throughout the years.

## Results

Across the three years of the project there were no statistically significant differences demonstrated in students' EI scores between countries or between years. The mean scores per year over time showed a small but not statistically significant change within the 2nd year of the study, when there was a slight fall in the mean scores. The sensitivity analysis showed that the characteristics of the questionnaire completer group was not significantly different to the non-completer group.

## Conclusions

EI was not seen to change during the non-explicit EI content curricula within this study. The robustness of this finding falls away in the latter stages of this longitudinal study. Further research is recommended in curricula with explicit EI content. This study has provided a valuable benchmark for pre-explicit EI curricula.

## **Introduction**

Emotional intelligence (EI) has been highlighted as a predictor of improved work performance, patient satisfaction and career selection within medicine and allied health fields over the past decade<sup>1</sup>. Its importance has been particularly noted for diagnostic radiography and radiotherapy practitioners as these professionals often face highly emotive, personal tasks and work within a complex context of health, trauma and cancer service provision<sup>2</sup>. This paper continues to explore EI in the context of these practitioners' development, presenting the second part of an extensive international longitudinal study investigating student EI<sup>3,4</sup>. The trait model has been used for this work and was conducted within four higher education institutions, who tracked the development of trait EI in student radiographers as they progressed through their two to four-year qualification programmes. It also provides a comparison of data gathered from this cohort of students with published studies of qualified practitioners in both UK<sup>2</sup> and Australian populations<sup>5</sup>.

## **The Background for Emotional Intelligence models**

For over two decades, two main EI theories have been constantly applied in research: the trait model<sup>7</sup> and the ability model<sup>8</sup>. Due to the establishment of such a polarised environment within the EI research community, there has been much discussion regarding which model is most suitable when conducting educational research into EI such as the **randomised controlled trial** conducted by Nelis et al<sup>9</sup>.

In order to evaluate the way in which radiography students use emotions and perceive their emotional abilities, and due to its use in the early part of this longitudinal project, the trait model with its validated assessment tool, the Trait EI or emotional self-efficacy questionnaire, was selected. It has psychological conceptual roots and was preferred over the ability model whose test, the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) suffers from a number of reported limitations,<sup>8, 10-12</sup> and mainly measures EI as a cognitive ability rather than as a personality trait. As Petrides and Furnham conclude,<sup>13</sup> there is no reason why these two concepts, trait and ability, cannot coexist.

## **Preliminary findings from this longitudinal study**

Mackay et al.<sup>3</sup> reported that qualified practising radiographers (both diagnostic radiographers and radiation therapists) have higher EI scores by comparison to radiography students at the start of their radiography programmes.<sup>3</sup> The Australian students' scores were compared to Australian qualified radiographer population data and revealed significant differences in Global EI and three of the four factors with the qualified radiographers mean scores being higher than the students. Global EI score Students (S) = 5.01, Qualified (Q) = 5.27 ( $p \leq 0.01$ ); Well-being S = 5.39, Q = 5.82 ( $p \leq 0.01$ ); Self-Control S = 4.72, Q = 5.03 ( $p \leq 0.01$ ); Emotionality S = 5.11, Q = 5.25 ( $p \leq 0.05$ ). Similar findings were demonstrated when UK and Irish students were compared to the UK qualified radiographer population data with highly significant differences in Global EI and three of the four factors when compared with the UK qualified radiographers. Again the qualified population mean scores were higher than for the students. Global EI score Students (S) = 5.04, Qualified (Q) = 5.28 ( $p \leq 0.01$ ); Well-being S = 5.41, Q = 5.75 ( $p \leq 0.01$ ); Self-Control S = 4.52, Q = 4.89 ( $p \leq 0.01$ ); Emotionality S = 5.10, Q = 5.38 ( $p \leq 0.01$ ).

This data suggests that somewhere between the start of a radiography programme and practising as a qualified radiographer there is an increase in the EI of student radiographers. Yet the validation data supplied with the Trait EI questionnaires<sup>7</sup> states that trait EI is likely to remain stable during one's life with two exceptions. One is severe and abrupt changes to a person's circumstances, such as divorce or health problems, and the other is through "...conscious efforts on the part of the individual." p21. Therefore, it is reasonable to suggest that a student undertaking a degree programme will be experiencing aspects of the curriculum which might impact on their EI such as reflection, exposure to emotionally charged patients and staff encounters in healthcare. For example, a recent study by Revera and Lee<sup>14</sup> showed changes in students' EI through diversity education in a hospitality management degree and Nelis<sup>9</sup> has shown changes in students' EI following a training programme using techniques and content such as role play, communications skills training and reflection.

So, rather than EI remaining stable over the lifespan of a radiography student, radiography curricula, along with changes in personal circumstances such as leaving home to go to university, gaining autonomy, learning at a higher level of education, or experiencing the initial steep learning curve in entering a health profession might all influence the change needed to alter an individual's Trait EI.

It is as yet unknown whether experiencing a radiography degree curriculum, qualification and the transition from student to autonomous practitioner or indeed the first few years of practice might be the catalyst for changes in EI. However, it is important to note at this stage that the curricula involved in this study (and earlier work by Mackay et al,<sup>3</sup> and McNulty et al,<sup>4</sup> ) did not have dedicated interventional programs designed to improve EI, unlike those in the work of Nelis<sup>9</sup> or Revera and Lee.<sup>14</sup>

### **Aims and objectives of the study**

This paper presents the findings from the first three years of a longitudinal study following a cohort of radiography and radiotherapy students through their qualification programmes. The aim was to demonstrate any changes in EI that might occur during the curricula and to clarify the timing of any changes.

The objectives of this study were to:

- Benchmark the trait EI scores of radiography students across the first three years of their programmes.
- Analyse the change over time of the global trait EI and the four factors of wellbeing, self-control, emotionality and sociability.
- Explore any differences in the EI characteristics between radiographic discipline and country (NB it was noted the Hong Kong is a 'special administrative region' of China but was called a country in this article for ease of reference).

Hypothesis: that global EI and factor scores of students would increase over the course of the programmes of study

It should be noted that, in this paper, the term 'radiography' has been employed as a nomenclature referring collectively to both diagnostic radiographers (DR) and radiation therapists (RT) or radiotherapy radiographers taking account of different international terms for these professionals.

### **Methods**

This study was an international collaboration between four higher education institutions: University College Dublin, Ireland, the University of Liverpool, UK, The Hong Kong Polytechnic University, Hong Kong and the University of Sydney, Australia. It was a longitudinal, cohort study with a total of 485 students eligible for inclusion at the commencement of the data collection. For the second and third years, there was a reduction in response rates (see Table 1). In order to assess EI scores, the short form of the trait EI questionnaire (TEIQue-SF<sup>7</sup>) was employed, along with a page of the questionnaire aiming to capture demographic data including age, gender and programme type. This study version of the questionnaire was made available in both online and paper formats.

**Table 1: Response rates for first three years of the longitudinal study**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
Number of students eligible to complete questionnaire	485	469	373
Number of students completing at start of each year	274	190	140
<b>% response rate</b>	<b>56.5</b>	<b>40.1</b>	<b>37.5</b>

To gather data for 1st, 2<sup>nd</sup> and 3rd year students, EI scores were measured at three different moments across the academic year. The first time-point corresponded to the beginning of the first semester, with the second one at the beginning of the second semester and, finally, the third time-point related to the end of the academic teaching year but before summative assessments. These time points were chosen so as to improve response rates, not interfere with the preparation and sitting of the end of year examinations and yet provide time for EI development between measurements. Students attended their universities and clinical placements in blocks of time throughout the curriculum, exposing them to the emotional rigours of clinical practice in diagnostic radiography<sup>15</sup> and radiotherapy<sup>16</sup>.

Since this study aims to investigate changes over time in the five domains of EI and differences between countries and radiography programmes, the statistical analysis employed was the repeated measures (mixed) ANOVA (Greenhouse-Geisser methods). Age and gender were also

included in the models, as these were considered possible confounding factors. Furthermore, since responses gradually reduced throughout the years, sensitivity analysis was also applied.

Ethical approval from all four institutions was in place for the duration of the project.

## Results

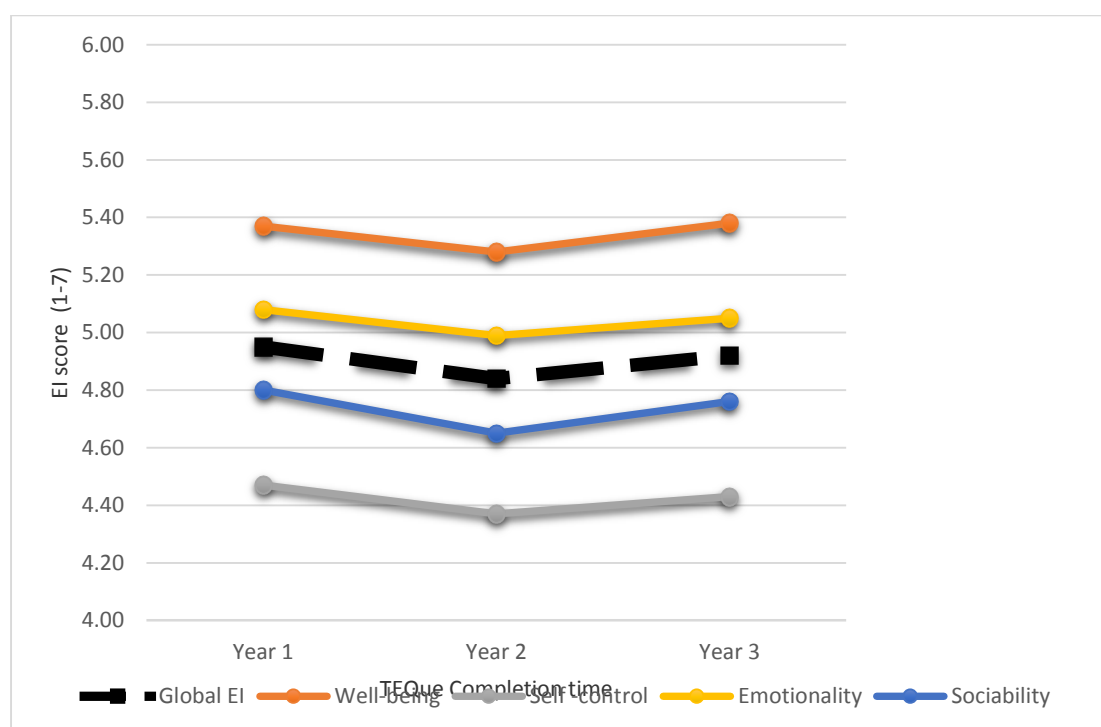
Descriptive statistics considering all three years are presented in Table 2. It should be noted that there were several missing data points over the three years due to lack or partial completion of questionnaires and student attrition from the programmes. This occurred at each time point leading to small numbers who completed all time points. There were 31 students who completed all time points in year 1 and 2, and 16 who completed all 9 time points throughout the three years. This article will present the holistic analysis for the whole three years of the project initially and then provide a more detailed analysis from across each of the three years.

**Table 2. Descriptive statistics across the three years of the project**

Variable	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year
<b>In Year Time point</b> (number of <b>questionnaire completers</b> )			
1 <sup>st</sup>	274	190	140
2 <sup>nd</sup>	237	162	119
3 <sup>rd</sup>	185	129	91
<b>Gender n (%)</b>			
Male	105 (38%)	67 (35%)	47 (34%)
Female	169 (62%)	123 (65%)	93 (66%)
Age mean (standard deviation)	19.84 (4.38)	21.9 (4.56)	22.15 (4.25)
<b>Country</b> (no. of responders at time point 1)			
Australia	61	38	0

Ireland	32	34	27
HK	114	58	51
UK	67	60	62

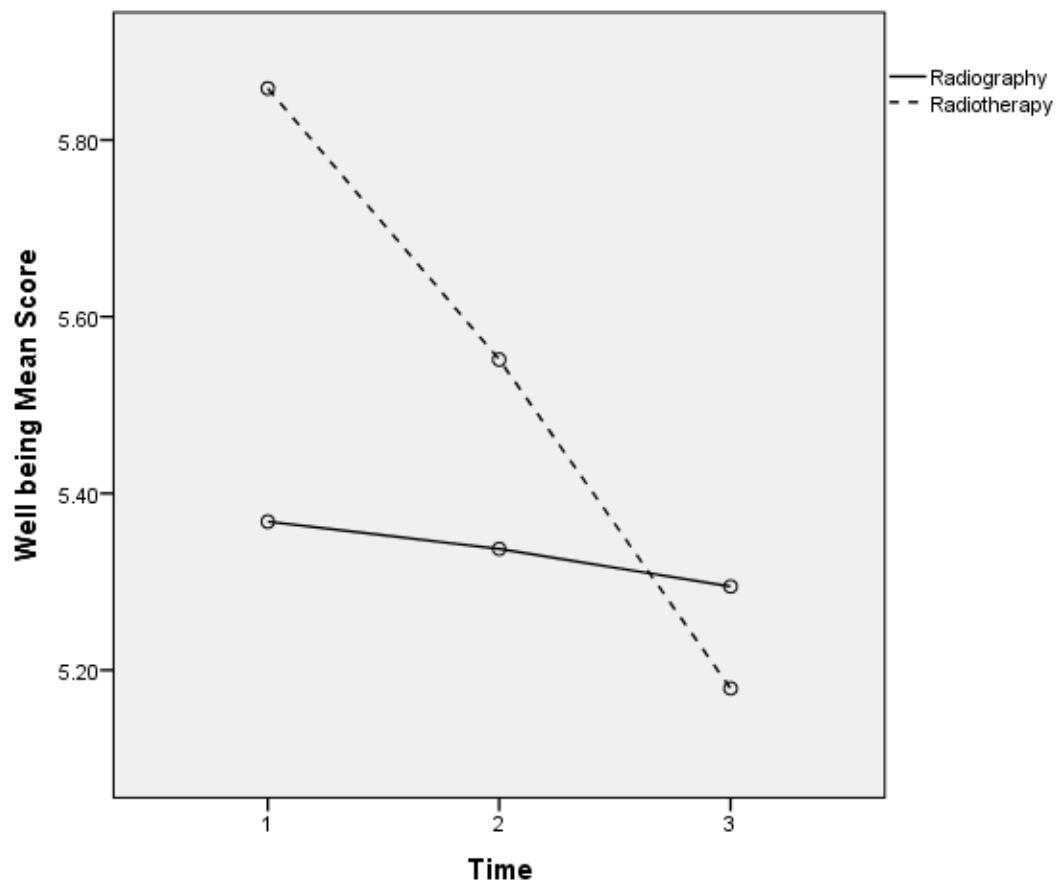
**Figure 2: Changes in student emotional intelligence over time (mean yearly group scores) across all institutions**



Across the three years of the project there were no statistically significant differences demonstrated in students' EI scores between countries or between years. Figure 2 shows the mean scores per year over time showing a small but not statistically significant change within the 2<sup>nd</sup> year of the study, when there was a slight fall in the mean scores. **This supports the need to reject the original hypothesis.**

**Figure 3 Differences over time between the diagnostic radiography and radiotherapy student groups for the Well-being factor in year 2 (mean yearly group scores).**





**Table 3: Statistically significant changes in discipline over time in year 2 (\* $p \leq 0.05$ ).**

Analysis	F statistic	P-value
Time	5.31	0.03*
Time x discipline	3.44	0.07

There was a statistically significant difference in the Well-being factor over time and between the disciplines in year 2. Both disciplines showed a drop in Well-being over time with the drop by the radiotherapy group being greater than the diagnostic radiography group.

#### **Sensitivity analysis of year 2 completers**

A comparison of year 1 and year 2 questionnaire participants (mean of all time points) was undertaken. The 31 students who completed all time points in year 1 and 2 were compared with the EI scores of the group in year 1 and 2. The question being is the EI profile of the 31 who completed all time points different to those who only completed some of the time points, i.e. are the 31 representative of the whole group or not.

**Table 4: sensitivity analysis of participants at all time points with the year 1 and year 2 groups**

	<b>Year 1 (n=243)</b>		<b>Year 2 (n=159)</b>		<b>Participants at all time points (n=31)</b>
	<b>Mean (st. dev)</b>	<b>P-value</b>	<b>Mean (st. dev)</b>	<b>P-value</b>	<b>Mean (st.dev)</b>
<b>EI</b>	4.67 (1.12)	0.14	4.90 (0.61)	0.46	5.00 (0.62)
<b>Well-being</b>	5.14 (1.05)	0.06	5.43 (0.79)	0.64	5.52 (0.82)
<b>Self -control</b>	4.58 (0.80)	0.18	4.29 (0.94)	0.65	4.38 (0.75)
<b>Emotionality</b>	4.95 (1.05)	0.81	5.03 (0.71)	0.81	4.99 (0.73)
<b>Sociability</b>	4.61 (0.91)	0.03*	4.25 (0.73)	0.15	4.49 (0.87)

The perception of EI of our 31 participants for all time points' shows statistically significant differences to the rest of the year group in 2<sup>nd</sup> year in only one factor. It is different to their EI scores in the sociability factor when in 1<sup>st</sup> year. Overall, their EI characteristics are generally similar to the rest of the group. Consequently, we can have some confidence that the EI scores for this small sample of regular participants are fairly representative of their peer group.

In year 3 the number of students responding to all time points reduced again to 16 and this made the analysis less meaningful. The cross-time analysis of time points in year 3 showed no statistically significant differences. A further analysis was undertaken comparing these 16 participants, against the year 1, 2 and 3 group mean scores. This revealed a **statistically** significant difference only for the Self-control factor in year 2. This dipped in year 2 but in year 3 it returned to a similar level as in year 1. So again, we can have some confidence that the EI scores for this small sample of participants are fairly representative of their peer group.

**Table 5: Comparison between mean scores of participants in each year (\*p≤0.05)**

(n=16)	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>		
	Mean (st. dev)	Mean (st. dev)	Mean (st. dev)	<b>F statistic</b>	<b>P-value</b>
<b>EI</b>	4.95 (0.57)	4.84 (0.64)	4.92 (0.67)	1.17	0.31
<b>Well-being</b>	5.37 (0.81)	5.28 (0.85)	5.38 (0.88)	0.57	0.57
<b>Self -control</b>	4.47 (0.72)	4.37 (0.94)	4.43 (0.89)	4.19	0.02*
<b>Emotionality</b>	5.08 (0.72)	4.99 (0.71)	5.05 (0.67)	0.29	0.75
<b>Sociability</b>	4.80 (0.70)	4.65 (0.81)	4.76 (0.92)	0.38	0.68

## Discussion

Overall, there were no significant differences in the students' EI scores across the three years, suggesting that students' perceptions of their EI skills did not change during delivery of the 4 curricula in this study. This was a surprise finding given that our research group had evidence for the initial EI scores for this group being low and comparable to the EI norms of the general population<sup>3</sup> and that in comparison to mean radiographer population scores in both the UK and Australia, the global EI and three of the four factors were significantly different and higher<sup>3</sup>. There could be several reasons for these unpredicted results.

There may be methodological reasons related to the response rates. There was a reduction in the number of respondents over time and particularly in the latter part of the study with only 16 students completing all nine time points. This is a known weakness of questionnaire survey design<sup>17</sup> with 'respondent burden' impacting on the poor response rates despite both online and paper versions being provided to students. It was noted during the study that the rates were reducing but extra reminders and physically attending the classrooms of students to appeal to them to complete questionnaires failed to be sufficient in the latter stages of this study. If this study were to be repeated the authors suggest reducing the number of time points, incorporating questionnaire completion into a timetabled session as part of a face-to-face lesson and providing ethically sound inducements to students to help encourage their engagement.

Nonetheless, the good response rates in year 1 and 2 failed to yield data which was **statistically** significant, supporting the finding of no change in Trait EI during the curriculum. Participants completing all time points in year 1 and 2 were not statistically significantly different in their EI profiles to their peers in year 1, which adds support to the robustness of the findings in the first two years of the study.

Another possible explanation for the lack of change may be that the instrument was not suitable to demonstrate changes in EI. It was noted that Nellis<sup>9</sup> used the trait EI SF to demonstrate changes in EI following an educational intervention and this fits with Petrides' notion that the trait EI can be used to demonstrate changes if there is a conscious effort on the part of the individual. However, it may be that the students were not making conscious efforts to change aspects of their EI as they were not sufficiently aware of its existence. The curricula delivered on the nine different programmes across the four institutions were all approved by the local regulatory and/or professional bodies and met the requirements for registration as a radiographer but they did not include explicitly taught EI content. This meant that students were not made aware of the theory of EI and so may not have had the vocabulary nor sufficient awareness of its relationship to the content of their studies. In the UK in 2012, the Health and Care Professions Council, which sets out the expected content of allied health professions' curricula and professional practice, made it explicit through the then, new Standards of Proficiency, number 5.2, that radiographers should *"understand the emotions, behaviours and psychosocial needs of people undergoing radiotherapy or diagnostic imaging, as well as that of their families and carers"*<sup>18</sup>.

Therefore, it is suggested that EI is well suited to emotional development and awareness training and should now be explicitly included in radiography and radiotherapy curricula and that this study could then be repeated to enable a more robust test of change in EI during students' pre-registration programmes.

In the 2<sup>nd</sup> year there was a statistically significant drop in the Well-being factor for both the radiotherapy and diagnostic radiography cohorts. This may be related to the phenomena which is known in UK radiography education circles as the '2<sup>nd</sup> year dip' and relates to a reduction in motivation and enjoyment of the programme. Students starting the 1<sup>st</sup> year are motivated by the new experiences the programme brings and their novel experiences at the university and in clinical practice. In the third year they are motivated by having a short year which will end in

qualification as a professional and the need to take on the responsibility that comes with that. Year 2 is perceived as a difficult middle year and a dip in motivation and enjoyment of the course can occur which would relate to the dip in Well-being.

If this lack of change in EI during the curriculum is a real finding, then the differences in EI between student and practitioner populations<sup>3</sup> must be occurring at another time point. The preceptorship period has been noted as a key developmental stage for radiographers<sup>19</sup>. In the UK and Hong Kong, radiographers achieve registration and professional competence upon qualification. In Australia, graduates of three year programmes undertake a supervised practice year before applying for full (general) registration.<sup>20</sup>

Of interest here is the work of Naylor,<sup>21</sup> whose recent PhD study determined that newly qualified graduates' awareness of departmental culture and their own professional identity increased during this immediately post qualification period. This may be a time when their awareness of EI is heightened and possibly increased.

## **Conclusions and Recommendations**

EI was not seen to develop during the nine non-explicit EI content curricula within this study. The robustness of this finding falls away in the latter stages of this longitudinal study. Further research is recommended in curricula with explicit EI content and maybe use of other EI measures would help to provide a fuller assessment of the phenomenon of EI. This should incorporate the methods suggested in this study to improve questionnaire response rates such as ethically sound inducements, or face to face contact with participants. Nonetheless this study has provided a valuable benchmark for pre-explicit EI curricula and moved the focus to the preceptorship period as a potentially important stage in EI development of radiographers.

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