

Insight into the emotional well-being of South African diagnostic radiography students during workplace learning

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ARTICLE INFO

Article history:

Received 21 April 2025

Received in revised form

30 May 2025

Accepted 10 June 2025

Available online 24 June 2025

Keywords:

Clinical training

Medical imaging and radiation sciences

Mental health

Placement

WIL

ABSTRACT

Introduction: Workplace learning is a significant component of radiography education. While studies about the structure, characteristics and coping mechanisms of workplace learning exist, diagnostic radiography students' emotional well-being during workplace learning remains unexplored. Therefore, this study investigated South African diagnostic radiography students' emotional well-being during workplace learning.

Methods: A quantitative approach using a cross-sectional survey design was used to collect data through an online questionnaire from undergraduate diagnostic radiography students at five randomly selected higher education institutions in South Africa. Data were analysed statistically.

Results: The survey received 265 responses (24.2 % response rate). Most participants (39.6 %) were in their second year of study, 21 years old (28.1 %) and attended public workplace learning centers (52.7 %). The majority of participants (77.7 %) experienced emotionally challenging situations during workplace learning, with the highest levels of emotional distress in forensic radiography (28.6 %), interactions with doctors (19.5 %), and working with burn patients (48.6 %). To cope, 15 % focused on the tasks at hand, and 23.8 % wanted more support. Participants viewed challenges as opportunities for growth, with 65.8 % feeling more confident as they progressed in their degree and 77.2 % gaining awareness of their responses and resilience in the face of emotional challenges.

Conclusion: South African diagnostic radiography students experience workplace learning challenges that affect their emotional well-being during workplace learning. While participants shared the need for more support, others saw it as an opportunity to grow and reflect on their responses and resilience.

Implications for practice: The stressors identified in the study can be addressed to ensure diagnostic radiography students' emotional well-being, which impacts their cognition and quality of patient care.

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Introduction

The workplace learning pedagogy is fundamental to radiography education, linking classroom theory with practical application in the clinical setting.¹ Workplace learning is the process of gaining knowledge, skills, and competencies through engaging in real-world tasks, interactions, and experiences within the work environment.^{2,3} This approach allows students to apply theoretical

knowledge in real-world healthcare environments while developing essential skills such as relevant competencies, decision-making, critical thinking, self-confidence, and effective communication in a supervised context.^{4–8} However, this practical learning experience can be physically and mentally demanding, as students must balance rotations between the workplace for hands-on experience and their university studies for theoretical lessons.

Radiography students encounter a variety of stressors during workplace learning, including the fear of making errors or having repeated examinations, feelings of unpreparedness or

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inexperience, intimidation, dealing with challenging, critical, dead or dying patients, receiving hurtful criticism, and facing negative responses to their questions or requests for help.^{9–11} These stressors can also encompass personal, economic, social, and academic challenges that affect their emotional well-being.^{1,11} Emotional well-being involves experiencing a balance of emotions, such as joy, sadness, anger, and anxiety, while maintaining resilience, self-awareness, and emotional stability.¹² It is a critical aspect of overall mental health, influencing how individuals think, feel, and react to life's challenges. Therefore, radiography students' emotional well-being is essential to ensure cognition and provide optimal quality patient care.^{9,13}

Research on workplace learning in radiography within South Africa (SA) has primarily focused on the structures of workplace learning and coping mechanisms for students^{5,14} with limited focus on the emotional well-being of students during this process. Similarly, globally, there are limited studies on diagnostic radiography students' emotional well-being during workplace learning.^{9,15} Therefore, this study aimed to investigate the emotional well-being of radiography students during workplace learning in the South African context.

Radiography education in SA is offered at eight higher education institutions, incorporating workplace learning as a mandatory component of the curriculum. The Health Professions Council of South Africa (HPCSA) accredits radiography departments as workplace learning centers affiliated with a higher education institution where workplace learning can occur. Since the Bachelor's degree in diagnostic radiography requires four years of full-time study, students will spend a minimum of 4 years at workplace learning sites. The importance of this study is to uncover the emotional well-being of radiography students during workplace learning in the South African context.

Methods

Research design

The study employed a quantitative approach with a cross-sectional online survey design. A cross-sectional survey collects data at a specific point in time and is effective for exploring relationships between variables, assessing the prevalence of specific phenomena, and understanding perceptions within a particular population and therefore was found appropriate to meet the study's aim.^{16,17}

Research setting

The study was set in SA among the eight higher education institutions offering radiography education.

Population and sampling

The target study population comprised 1434 undergraduate diagnostic radiography students from eight higher education institutions offering diagnostic radiography. Five higher education institutions were randomly sampled using the Excel RAND function, resulting in an estimated sample size of 1094, providing a 95 % confidence interval with a 5 % margin of error. The inclusion criteria were undergraduate diagnostic radiography students over the age of 18 who had experienced at least one workplace learning placement.

Data collection process

Following ethical clearance and gatekeeper permissions, the study advert containing the link to the study information letter was shared with the heads of departments of the five selected institutions. Prospective participants clicked on a link in the study information letter to access the consent page. Only those who agreed to participate were directed to the online questionnaire. The questionnaire was based on an existing questionnaire which aimed to determine diagnostic radiography students' perception of factors that contribute to negative emotional well-being on clinical placement.⁹ Girn et al.'s⁹ questionnaire was validated through a pilot study. Permission to use the questionnaire was obtained from the authors.⁹ The questionnaire was contextualised to the South African context and curriculum, and content validity was established through a pilot study. The questionnaire was reviewed by medical imaging academics and piloted among five 2022 final-year diagnostic radiography students from one higher education institution. The questionnaire contained multiple response questions and had three sections: A: demographics, B: emotional well-being – emotional distress rated for modality, professionals and patients, experience, effect and coping; and C: emotionally challenging situations. Internal consistency of the questionnaire was assessed with Cronbach's alpha. Emotional distress for modalities ($\alpha = 0.804$), patients ($\alpha = 0.855$), and experience ($\alpha = 0.752$) had acceptable internal consistency. Emotional distress related to interactions with healthcare professionals showed moderate internal consistency ($\alpha = 0.647$). Data collection took place from November 2023 to April 2024. Data analysis included frequency, mean, standard deviations, Spearman's rank-order correlation, Pearson's chi-square and Kruskal–Wallis tests. A p-value < .05 represents statistical significance.

Ethical considerations

Ethical clearance was obtained from three higher education institutions, and the remaining two institutions provided gatekeeper permissions to access undergraduate diagnostic radiography students. The study information letter approved by the research ethics committee was shared with prospective participants, and only those who voluntarily consented to participate in the study were directed to the online questionnaire.

Results

The study response rate was 24.2 % based on 265 returned questionnaires from the approximate sample of 1094 diagnostic radiography students at the time of data collection. Response rates to individual questions varied, with only 170 participants completing all questions in the questionnaire. The highest number of responses was from participants in their second year of study (39.6 %, $n = 105$, $N = 265$) and the lowest from the first year of study (10.9 %, $n = 29$, $N = 265$). Most participants were 21 years old (28.1 %, $n = 71$, $N = 253$), with participants ranging from 18 to 32 years old. More participants trained at public workplace learning centres (52.7 %, $n = 139$, $N = 264$) versus a private centre (47.3 %, $n = 25$, $N = 264$).

Most participants (77.7 %, $n = 205$, $N = 264$) experienced an emotionally challenging/distressing situation during their workplace learning. On average, participants rated cardiac catheterisation, emergency/casualty, forensic radiography, and theatre as areas where they experience moderate emotional distress. Forensic radiography had the highest frequency for very high emotional distress (28.6 %, $N = 28$, $n = 8$, mean 3.04, SD 1.575), as shown in Table 1.

Table 1
Emotional distress rated for an area of work and professionals (multiple response questions).

	No emotional distress (1)	Low emotional distress (2)	Moderate emotional distress (3)	High emotional distress (4)	Very high emotional distress (5)	Mean	SD
Areas of work							
Angiography (N = 102)	14,7 %	24,5 %	31,4 %	24,5 %	4,9 %	2.80	1.117
Bone densitometry (N = 86)	39,5 %	41,9 %	10,5 %	8,1 %	0	1.87	0.905
Cardiac catheterisation laboratory (N = 67)	13,4 %	20,9 %	23,9 %	22,4 %	19,4 %	3.13	1.325
Computed tomography (CT) (N = 182)	22,0 %	23,1 %	36,3 %	15,9 %	2,7 %	2.54	1.085
Emergency/casualty (N = 237)	14,3 %	19,8 %	28,7 %	26,2 %	11,0 %	3.00	1.216
Fluoroscopy (N = 220)	23,6 %	33,2 %	27,3 %	10,9 %	5,0 %	2.40	1.112
Forensic radiography (N = 28)	25,0 %	14,3 %	21,4 %	10,7 %	28,6 %	3.04	1.575
General x-ray (N = 264)	34,8 %	27,3 %	21,2 %	11,4 %	5,3 %	2.25	1.198
Mammography (N = 104)	44,2 %	30,8 %	17,3 %	2,9 %	4,8 %	1.93	1.082
Mobile x-rays/Bedside units (N = 259)	12,4 %	26,6 %	29,0 %	20,8 %	11,2 %	2.92	1.190
Magnetic resonance imaging (MRI) (N = 106)	22,6 %	15,1 %	31,1 %	15,1 %	16,0 %	2.87	1.360
Paediatrics (N = 225)	12,4 %	24,9 %	33,8 %	16,4 %	12,4 %	2.92	1.187
Theatre (N = 206)	15,5 %	18,4 %	28,6 %	23,3 %	14,1 %	3.02	1.269
Professionals who students interact with during workplace learning							
Physicians/doctors (N = 256)	15,6 %	21,9 %	34,0 %	19,5 %	9,0 %	2.84	1.175
Radiologist (N = 255)	27,8 %	21,6 %	24,7 %	15,7 %	10,2 %	2.59	1.316
Radiographers (N = 265)	21,5 %	26,4 %	32,8 %	11,7 %	7,5 %	2.57	1.169
Nurses (N = 261)	23,0 %	23,8 %	25,3 %	16,9 %	11,1 %	2.69	1.297
Other (N = 56) [Administrative staff (7), cleaners (4), clinical tutor (1), heads of departments (2), patient's family (1), physiotherapists (4), speech therapist (1), dietician (1) and porters (6)]	42,9 %	19,6 %	12,5 %	8,9 %	16,1 %	2.36	1.507

N: number of times the option was rated.

Participants, on average, rated all professionals they interacted with during their workplace learning as low to moderate emotional distress (physicians/doctors [mean 2.84], radiologists [mean 2.59], radiographers [mean 2.57], nurses [mean 2.69], other [mean 2.36] where the rating scale was 1-no emotional distress to 5 very high emotional distress). Physicians/doctors were rated the highest (19,5 %, n = 50, N = 256, mean 2.844, SD 1.175) for high emotional distress, as shown in Table 1.

Participants rated their level of emotional distress with patients (Table 2). Patients in suffering/pain (emotional, vocal, screaming, etc.) were, on average, rated with the highest emotional distress, followed by burns patients and domestic/gender-based violence patients. The highest, very high emotional distress (21.4 %) and high emotional distress (27.2 %) ratings were for burns patients.

Participants' reactions to emotionally challenging situations varied; most focused on the task of imaging at hand (15,0 %, n = 98, N = 655 [total number of responses for the multiple response question]), followed by speaking to a family member (14,4 %, n = 94, N = 655), talking to student peers (13,3 %, n = 87, N = 655),

dealing with it personally, e.g. cried (12,1 %, n = 79, N = 655). Few participants reached out to academics (3,8 %, n = 25, N = 655), work-integrated learning coordinators (1,8 %), spoke to their clinical tutor (7,6 %, n = 12, N = 655) or radiographers at their workplace learning center (7,9 %, n = 52, N = 655). Only 4 % (n = 26, N = 655) of participants sought counselling services or psychological support. In comparison, others did nothing (11 %, n = 72, N = 655) because they did not want to appear as not being able to cope (29,1 %, n = 16, N = 55), did not feel the need to seek support (21,8 %, n = 12, N = 55), were unsure of who or where to seek support (18,2 %, n = 10, N = 55) and were concerned about how their superior would respond if they looked for support (18,2 %, n = 10, N = 55). Some participants answered that they were afraid to fail if they reacted to their emotionally challenging situation, and when they did seek assistance, nothing was done, and they were labelled "complainers".

A Pearson chi-square test of the year of study and having experienced emotional distress during clinical placements showed a significant association, χ^2 (3, N = 264) = 11.39, p = 0.010, with

Table 2
Emotional distress rating for patients (multiple response questions).

	No emotional distress (1)	Low emotional distress (2)	Moderate emotional distress (3)	High emotional distress (4)	Very high emotional distress (5)	Mean	SD
Mental health patients (self-harm or drug use) (N = 224)	12,5 %	18,3 %	30,4 %	22,3 %	16,5 %	3.12	1.249
Palliative care patients (N = 202)	13,9 %	21,8 %	39,6 %	18,3 %	6,4 %	2.82	1.089
Intensive care unit (ICU) patients (N = 256)	10,9 %	16,0 %	30,9 %	24,6 %	17,6 %	3.22	1.227
Paediatric patients (N = 244)	13,5 %	25,4 %	31,1 %	18,0 %	11,9 %	2.89	1.202
Neonatal patients (N = 232)	22,0 %	22,8 %	22,0 %	20,3 %	12,9 %	2.79	1.339
Burns patients (N = 206)	10,7 %	14,6 %	26,2 %	27,2 %	21,4 %	3.34	1.261
Geriatric patients (N = 237)	17,7 %	30,0 %	36,7 %	10,5 %	5,1 %	2.55	1.059
Bariatric patients (N = 211)	16,6 %	24,2 %	36,5 %	12,8 %	10,0 %	2.75	1.173
Non-accidental injury (NAI) patients (N = 233)	38,2 %	24,0 %	20,6 %	10,7 %	6,4 %	2.23	1.245
Acute trauma patients (N = 255)	16,5 %	25,5 %	31,8 %	17,6 %	8,6 %	2.76	1.177
Motor vehicle accident (MVA) patients (N = 259)	9,3 %	21,6 %	26,3 %	26,6 %	16,2 %	3.19	1.213
Domestic/gender-based violence patients (N = 219)	7,8 %	23,3 %	27,9 %	20,5 %	20,5 %	3.23	1.235
Forensic situations (related to the law) (N = 89)	31,5 %	14,6 %	21,3 %	22,5 %	10,1 %	2.65	1.391
Patients in suffering/pain (emotional, vocal, screaming, etc.) (N = 252)	4,8 %	16,7 %	31,3 %	27,0 %	20,2 %	3.41	1.127

N: number of times the option was rated.

Table 3
Coping with emotionally challenging situations (multiple response question with 650 ratings).

What would have better prepared you to cope with an emotionally challenging situation?	Per Cent
Coping strategies and tools (n = 79)	12,2 %
Receiving appropriate subject content from university courses (n = 55)	8,5 %
Obtaining more insight into the challenges of specific modalities (n = 101)	15,5 %
Learning from the personal experience of lecturers (n = 80)	12,3 %
Conducting simulation activities (e.g. first-hand experience of challenging situations in radiography) (n = 78)	12,0 %
Being made aware of the medical hierarchy (n = 90)	13,8 %
Receiving more support during workplace learning (n = 155)	23,8 %
Other (n = 12):	1,8 %
• Adjustments to clinical rules that would provide support for those facing mental health disorders. This could include more flexible scheduling, clear communication of assessment dates, and a supportive environment that encourages open discussions about mental health challenges.	
• Nothing. I Think experiencing those emotions helped me to grow and be more confident.	
• Peer support networks and regular debriefing sessions to discuss challenges and emotions.	
• Self-reflecting as to why I chose the course, my passion and my input into being part of the solution, how I can personally bring about trust into our fellow scope of practice (doctors, radiologists, nurses and radiographers) into working together to showcase innovation and bring about change and help to our patients without them ever thinking that the help they are getting is nothing but the best help that's not only is good for them but where they can have an input on how they want to be helped.	
• Workshops on effective communication or information resources on how to better understand effective and negative communication	

emotional distress increasing each year: 1st 62.1 % (n = 18, N = 29), 2nd 76.0 % (n = 79, N = 104), 3rd 74.6 % (n = 53, N = 71), 4th 91.7 % (n = 55, N = 60). A Kruskal–Wallis test showed a statistically significant difference in emotional distress ratings for modality [χ^2 (3, N = 265) = 71.85, $p < 0.001$], professional [χ^2 (3, N = 265) = 16.80, $p = 0.001$]and patient [χ^2 (3, N = 265) = 36.20, $p < 0.001$] across the four-year groups. The mean emotional distress ranking for modality: 1st (64.66), 2nd (106.84), 3rd (152.35), 4th (188.92); professional year 1st (86.17), 2nd (127.62), 3rd (143.18), 4th (153.00); patient: 1st year (69.88), 2nd (120.73), 3rd (150.15), 4th (164.68). Emotional distress increased with the year of study, and fourth-year students reported the highest emotional distress in all three domains.

Most participants expressed that the emotionally challenging situation had a short-term effect (42 %, n = 92, N = 219) on their emotional well-being, followed by an intermediate effect (19.6 %, n = 43), a long-term effect (17.8 %, n = 39) and 5.5 % (n = 12) an everlasting impact. Furthermore, 7.3 % (n = 16) noted no effect on their well-being, and 7.8 % (n = 17) were unsure.

Table 3 shows that most participants suggested receiving more support during workplace learning (23.8 %, n = 155) to prepare them better to cope with an emotionally challenging situation. In contrast, others thought emotional challenges were an opportunity to grow, learn and build confidence—participants' well-being rating before, during and after workplace learning is illustrated in Fig. 1.

Participants' experiences of workplace learning are depicted in Table 4. Most participants agreed and strongly agreed (65.8 %,

n = 169, N = 257, mean 3.77, SD 1.135) that they feel more confident during emotionally challenging situations as they progress through their studies. Most participants agreed and strongly agreed that the personal experiences of qualified radiographers provided insight into the emotionally challenging situations they may experience in workplace learning (59 %, n = 99, N = 168, mean 3.43, SD 1.270). Most participants agreed and strongly agreed (77.2 %, n = 196, N = 254, mean 3.91, SD 1.018) that they gained an awareness of their responses and personal resilience in emotionally challenging situations during workplace learning.

Spearman's rank-order correlation explored the relationship between emotional well-being during and after clinical placement and emotional distress ratings. A significant negative correlation was found between modality emotional distress and well-being during ($\rho = -0.209$, $p = 0.001$) and after placement ($\rho = -0.159$, $p = 0.012$). Professional emotional distress scores were more strongly negatively correlated with well-being during ($\rho = -0.304$, $p < 0.001$) and after placement ($\rho = -0.203$, $p = 0.001$). Patient-related emotional distress also negatively correlated with emotional well-being during ($\rho = -0.261$, $p < 0.001$) and after placement ($\rho = -0.147$, $p = 0.020$). Overall emotional distress was negatively associated with well-being during ($\rho = -0.273$, $p < 0.001$) and after ($\rho = -0.177$, $p = 0.005$) placement.

Discussion

The study sought to investigate the emotional well-being of South African undergraduate diagnostic radiography students during their workplace learning experiences, achieving a response rate of 24.2 %. Online surveys have the advantage of lower research cost, shorter survey execution time, and ease of analysis¹⁸; however, there are limitations to this method. In SA, intermittent electricity supply due to load shedding and access to a stable internet connection could pose a challenge to online surveys.¹⁹ A decline in survey response rates may be due to the rise in the number of surveys administered²⁰ and could result in survey fatigue. These reasons may explain the low response rate observed in this study.

Participants rated forensic radiography as very high in emotional distress. Similar opinions were shared by radiographers in Nigeria, Australia, and Ghana, who expressed concern over the anxiety experienced when providing forensic radiography services.^{21–23} Forensic radiography covers areas like person identification, disaster victim identification, and post-mortem imaging. However, it can also be used for paediatrics when there is

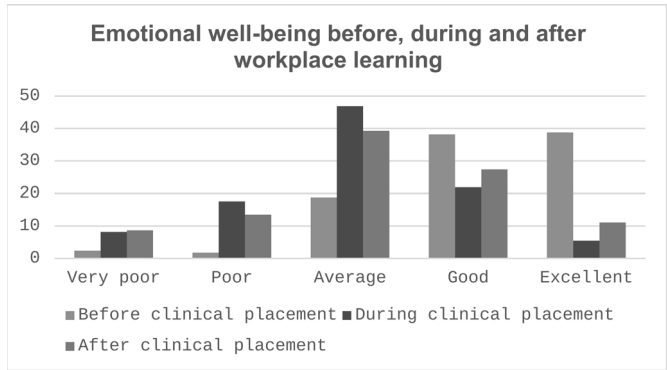


Figure 1. Emotional well-being before, during and after workplace learning.

Table 4
Experiences of workplace learning.

	Not applicable	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	SD
As I progress through my degree, I feel more confident during emotionally challenging situations in workplace learning. N = 257	0,8 % n = 2	3,9 % n = 10	8,9 % n = 23	20,6 % n = 53	35,8 % n = 92	30,0 % n = 77	3.77	1.135
I Feel that the course content has equipped me with strategies to use in emotionally challenging situations during workplace learning. N = 257		13,2 % n = 34	21,0 % n = 54	33,9 % n = 87	22,2 % n = 57	9,7 % n = 25	2.94	1.163
The work-integrated learning orientation conducted before placement was not helpful in preparing me for workplace learning. N = 257	7,4 % n = 19	12,1 % n = 31	24,1 % n = 62	26,1 % n = 67	18,3 % n = 47	12,1 % n = 31	2.72	1.408
The personal experiences of lecturers provided me with an insight into the emotionally challenging situations I may experience in workplace learning N = 252	7,5 % n = 19	4,8 % n = 12	11,9 % n = 30	29,8 % n = 75	34,5 % n = 87	11,5 % n = 29	3.13	1.335
The personal experiences of qualified radiographers provided me with an insight into the emotionally challenging situations that I may experience in workplace learning. N = 168	4,8 % n = 8	4,8 % n = 8	8,3 % n = 14	23,2 % n = 39	42,3 % n = 71	16,7 % n = 28	3.43	1.270
I Did not find any clinical situation emotionally challenging during workplace learning. N = 255	4,3 % n = 11	46,3 % n = 118	32,9 % n = 84	11,8 % n = 30	2,7 % n = 7	2,0 % n = 5	1.68	0.971
My clinical tutor was not approachable during or after an emotionally challenging situation in workplace learning. N = 265	4,3 % n = 11	28,1 % n = 72	30,5 % n = 78	20,7 % n = 53	7,4 % n = 19	9,0 % n = 23	2.26	1.306
My work-integrated learning coordinator or academic staff were not approachable during or after an emotionally challenging situation in workplace learning. N = 255	8,2 % n = 21	18,8 % n = 48	31,4 % n = 80	27,5 % n = 70	9,8 % n = 25	4,3 % n = 11	2.25	1.232
There have been times during workplace learning when I have had a negative experience in an emotionally challenging situation, but I did not tell anyone. N = 256	2,3 % n = 6	3,9 % n = 10	11,3 % n = 29	10,5 % n = 27	33,6 % n = 86	38,3 % n = 98	3.84	1.284
I Did not expect workplace learning to be emotionally challenging. N = 255	0,4 % n = 1	9,8 % n = 25	23,5 % n = 60	25,9 % n = 66	23,9 % n = 61	16,5 % n = 42	3.13	1.245
During workplace learning, I questioned my enrollment in this course due to an emotionally challenging situation that I encountered. N = 255	2,0 % n = 5	20,4 % n = 52	17,6 % n = 45	14,5 % n = 37	20,8 % n = 53	24,7 % n = 63	3.06	1.540
I Have gained an awareness of my response and personal resilience in emotionally challenging situations during workplace learning. N = 254	2,8 % n = 7	0,8 % n = 2	2,4 % n = 6	16,9 % n = 43	50,8 % n = 129	26,4 % n = 67	3.91	1.018
The emotionally challenging situations I experienced during workplace learning affected my performance in the work-integrated or clinical practice module/course. N = 256	2,0 % n = 5	10,2 % n = 26	25,8 % n = 66	25,4 % n = 65	23,4 % n = 60	13,3 % n = 34	2.98	1.269
Personal experience did not help me cope with emotionally challenging situations during workplace learning. N = 254	3,1 % n = 8	16,1 % n = 41	31,5 % n = 80	27,2 % n = 69	15,4 % n = 39	6,7 % n = 17	2.56	1.214
Speaking to someone about the emotionally challenging situation helped me cope with it better. N = 251	8,0 % n = 20	2,0 % n = 5	4,4 % n = 11	22,3 % n = 56	42,6 % n = 107	20,7 % n = 52	3.52	1355
The clinical debriefing after workplace learning helped me process the emotionally challenging situations that I encountered during workplace learning. N = 256	23,4 % n = 60	5,5 % n = 14	8,6 % n = 22	32,8 % n = 84	23,4 % n = 60	6,3 % n = 16	2.46	1618
I Feel better prepared to deal with emotionally challenging situations for my next workplace learning placement. N = 256	1,2 % n = 3	3,5 % n = 9	7,4 % n = 19	24,2 % n = 62	43,8 % n = 112	19,9 % n = 51	3.66	1062
Due to the emotionally challenging situations I experienced during this workplace learning, I am not looking forward to the next placement. N = 256	2,7 % n = 7	24,6 % n = 63	34,4 % n = 88	20,3 % n = 52	9,4 % n = 24	8,6 % n = 22	2.35	1262

suspected physical abuse or non-accidental injury.²⁴ Plain imaging radiography forms a significant part of imaging in paediatric non-accidental injuries²⁵, and the population is predominantly very young, often under the age of two, which heightens the emotional toll on students engaged in forensic radiography.²⁵ The emotional challenges students face are compounded by the need for resilience, which literature suggests is not solely the individual's responsibility but also involves their work environment.^{26,27} The current study indicates that the work environment impacts

student well-being, emphasising the importance of addressing environmental factors to help students build resilience. The findings suggest a need for institutional and environmental support to identify stressors and provide appropriate resources that foster resilience.

Participants experience emotional distress when working with medical doctors and physicians. These feelings, in return, may demotivate students and impact their emotional well-being during workplace learning. Radiography students often spend the

majority of their studies in the clinical environment, and to assist them, both radiography educators and radiographers supervising students during workplace learning need to gain a deeper understanding of students' clinical experience.²⁸ Students may feel overlooked and underappreciated due to a perceived lack of professional identity. Students could also feel that their contributions and efforts are unnoticed and unacknowledged due to their subsequent lower-level positions in the departmental organogram.²⁹ This may be due to a lack of effective mentorship in the clinical environment, as the prime responsibility of a mentor is critical for assisting the inexperienced individual (mentee) in growing both personally and professionally. An effective mentor-mentee relationship is focused on solving problems collaboratively in the context of emotionally challenging situations in the clinical environment. In addition, what may be emotionally challenging for one student may not be the same for another student, which means that mentors need to be cognisant of and be able to adapt to the unique needs of each mentee.³⁰

Diagnostic radiography students gain clinical competence in various medical imaging environments.³¹ Each environment is unique in view of the type of patients being served.¹ Patients who experience severe and visible pain, such as burns, may instil feelings of helplessness and/or distress among diagnostic radiographers.³² A study by Kyei et al.³³ revealed a lack of essential knowledge and training of radiographers to provide optimum care for patients who may be in pain. In addition, patients presenting with signs of domestic and/or gender-based violence add another layer of emotional complexity as students may find it challenging to balance professional detachment whilst remaining empathetic.³⁴ The current study highlights the need for additional training and emotional support for students to navigate clinically challenging situations.

Resilience is overcoming hardships while simultaneously challenging and transforming aspects of adversity to view it in a positive manner.³⁵ Many students consider health professions education to be highly stressful, and they often experience higher levels of anxiety, fatigue, burnout and decreased motivation.³⁶ First-year South African radiography students identified support from peers and friends as crucial in building resilience and coping with stress. Students found that discussing challenges and sharing similar experiences with senior students, peers at the same level, and even friends from other health professions helped alleviate stress.³⁷ Legg and Cohen¹¹ argue that students need help distinguishing between healthy and unhealthy coping mechanisms, which will assist them in becoming effective members of their professional communities. Unhealthy coping includes avoidance as well as substance abuse, whereas examples of healthy coping are aligned with cognitive reframing, meditation, and breathing.³⁸ Healthy coping mechanisms are crucial as students encounter several challenging situations during workplace learning, which is evident from the study results.

Thomas and Koch³⁹ presented the need to implement a dedicated clinical preparedness programme encompassing debriefing and reflection for first-time diagnostic radiography students entering the clinical environment. Peer support and group debriefing sessions are considered vital to foster a sense of shared understanding and resilience, which in turn will elevate the students' motivation levels.^{40,41} It is the opinion of the authors of the current paper that regular debriefing sessions during workplace learning should be introduced and facilitated at all student levels as a mechanism of collaborative support. Whilst there are situations that may be considered emotionally challenging for students when in the clinical environment, it is also understood that similar encounters may provide an opportunity for growth, which, in return, facilitates the development of skills to navigate similar

situations in the future.³⁷ From the results of the current study, the same notion was evident among the participants.

Cox's interactional model⁴² of stress posits that individuals face various stressors - physical, emotional, or environmental - whose impact varies based on personal factors like experience, education, and personality. The way a person evaluates and copes with these stressors is called cognitive appraisal.⁴² Sanderson and Brewer³⁶ (2017) recommend implementing resilience interventions to support student well-being. These interventions can help equip students with the necessary tools to manage stress and enhance their mental and emotional resilience throughout their education and future careers. A study by Khine et al.,⁴³ who targeted student radiographers, highlighted the importance of positive behavioural traits among qualified radiographers in student supervisory roles in workplace learning as an additional form of support. Examples of the traits identified include being caring towards the students, being approachable and encouraging.

Limitations

Although the response rate is considered low, the results are in keeping with previously published literature,¹⁹ and the authors reason that it does provide valuable insight towards a broader understanding of the topic. In addition, the target population of the current study was limited to diagnostic radiography students only and thus did not include ultrasound, nuclear medicine or radiation therapy students. Future research should consider including the previously mentioned student groups through a comparative lens, as their emotional well-being may differ in view of the professional services they offer in the clinical environment.

Conclusion

Undergraduate diagnostic radiography students surveyed in this study reported a decline in their emotional well-being during workplace learning. They experienced high levels of distress while working in forensic radiography, with patients in pain, burn patients, victims of domestic and gender-based violence, as well as patients in the intensive care unit. Participants requested more support during workplace learning through increased assistance with the challenges associated with specific modalities, navigating the medical hierarchy and learning coping strategies. As participants progressed through their studies, they generally felt more confident in handling emotionally challenging situations during workplace learning. Participants became more aware of their personal resilience and responses in emotionally challenging situations. To assist undergraduate diagnostic radiography students in emotionally challenging clinical conditions, curriculum changes, socialisation support strategies, regular debriefing, collaborative support and resources that promote resilience are recommended.

Ethics approval and consent to participate

Ethics approval was obtained from the:

- University of Johannesburg's Faculty of Health Sciences Research Ethics Committee (REC-2058-2023),
- Cape Peninsula University of Technology, CPUT/HWS-REC 2023
- University of Pretoria S19, 441/2023

Informed consent was obtained for anonymised information to be published in this article.

Availability of data

Data required for this study may be made available by the author(s) upon reasonable request.

Author contributions

SL: Conceptualisation, Methodology.

All authors: Data curation, Writing- Original Draft Preparation.

None: Supervision (non-qualification study).

GK, NP: Validation.

All authors: Writing, Reviewing, and Editing.

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Generative AI use (to support writing or proofing)

During the preparation of this work, the author(s) used Grammarly to support writing. After using this tool/service, the author(s) reviewed and edited the content as needed and take full responsibility for the content of the publication.

Conflict of interest statement

No conflict of interest.

Acknowledgements

The authors thank the participants who generously shared their experiences. We appreciate your time and participation in the study.

No funding was received for this study.

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