Resilience: a nationwide study of medical educators

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**Abstract**

**Background:** Medical educators have the potential to play an important role in addressing resilience issues across the medical education continuum. Yet, limited research has explored this cohort, particularly in the UK context. This study aims to address this gap by exploring resilience and the factors that relate to resilience in UK medical educators.

**Methods:** A cross-sectional online questionnaire was employed. It contained the validated Connor-Davidson Resilience Scale 25 (CD-RISC-25) and Patient Health Questionnaire-8 (PHQ-8), for determining medical educator resilience and depression levels respectively. Sociodemographic characteristics were also collected to identify potential factors associated with resilience. Finally, participants identified factors that facilitated or undermined their resilience through open-ended questions. Data was analysed using quantitative (e.g. multiple regression analysis), and qualitative (i.e. thematic framework analysis) approaches.

**Results:** Among 244 UK participants, the mean CD-RISC-25 score was 72.9 and standard deviation 10.3. The PHQ-8 score was the only significant negative predictor identified (B = -1.22, p < 0.001). Other sociodemographic variables examined were not found to be predictors of CD-RISC-25 scores. Educators identified multidimensional factors influencing their resilience, but predominately viewed internal factors as being supportive, and external factors as undermining.

**Conclusions:** Medical educators in this study had resilience levels that were comparable to other population samples. The study also highlights the importance of considering external factors, such as contextual and sociocultural influences, in addition to individual factors when addressing resilience.

**Keywords:** Resilience; medical educators; learners; depression; contextual; sociocultural.

**Introduction**

Among medical learners and practitioners, alarming rates of psychological distress have garnered attention in recent years (Dyrbye, Thomas and Shanafelt, 2006; Shanafelt et al., 2011; Dyrbye et al., 2014; Hope and Henderson, 2014;
Mata et al., 2015; Rotenstein et al., 2016). Further concern has arisen as literature highlights the potential negative implications of distress in physicians and trainees on patient care, as well as the healthcare system (Shanafelt et al., 2002; West et al., 2006; Shanafelt et al., 2010; Panagioti et al., 2017; West, Dyrbye and Shanafelt, 2018). In response, resilience has emerged as a prominent concept in the arena of clinician and learner well-being (Howe, Smajdor and Stockl, 2012; Southwick and Charney, 2012).

Resilience has multiple definitions within existing literature (Luthar, Cicchetti and Becker, 2000; Aburn, Gott and Hoare, 2016; Rogers, 2016). This study incorporates two overlapping views of resilience to provide theoretical support. First, Windle’s (2011) systematic review defines resilience as, ‘the process of effectively negotiating, adapting to, or managing significant sources of stress or trauma’ (Windle, 2011, pp. 163). This definition highlights the dynamic and complex nature of resilience, which depends not only on the individual, but also on resources available through his or her community, society, and culture (Windle, 2011). Linked to this holistic approach is the biopsychosocial-spiritual framework (Sulmasy, 2002), which considers the biological, psychological, social, and spiritual facets of resilience.

Resilience in medical education

Globally, research investigating resilience in medical learners has proliferated (Haglund et al., 2009; Peng et al., 2012; Cooke, Doust and Steele, 2013; Rahimi et al., 2014; Olson, Kemper and Mahan, 2015; Tempski et al., 2015; Bacchi and Licinio, 2017; Dyrbye, Shanafelt et al., 2017; Eley et al., 2017; Houpy et al., 2017; Oliveira, Machado and Aranha, 2017). In contrast, limited empirical studies have been conducted among medical educators (Cora-Bramble, Zhang and Castillo-Page, 2010; Sood et al., 2011; DeCastro et al., 2013; Sood et al., 2014; Porter et al., 2018). Compared to a wider group of clinicians, their educational focus uniquely positions them to cultivate resilience in their learners, as well as themselves. For example, this may be achieved through instruction in the formal curriculum, role-modelling in the informal, and creating a supportive learning culture as part of the hidden curriculum (Cruess, Cruess and Steinert, 2008; Goodyear, 2014; General Medical Council, 2015a; Abaza and Nelson, 2018). Consequently, examining the resilience of medical educators as a specific cohort is important.

In the broader medical education literature, a number of studies have investigated factors relating to resilience. Several have identified negative associations between resilience and facets of distress such as depression (Shi et al., 2016), burnout (Cooke, Doust and Steele, 2013), stress (Rahimi et al., 2014), and general mental health problems (Peng et al., 2012). However, we are not aware of any studies exploring facets of distress, such as depression, in relation to resilience in medical educators specifically. When considering the relationship between resilience and sociodemographic variables, inconsistencies have been reported (Davidson and Connor, 2015). For example, research involving Chinese (Peng et al., 2012), Canadian (Rahimi et al., 2014), and U.S. (Houpy et al., 2017) medical students found male students as having statistically higher resilience scores than females. Whereas, Elizando-Omaña et al. (2010) did not observe such differences in resilience scores by gender in Mexican medical students. For medical educators, Porter and colleagues (2018) found no associations between the resilience level of U.S. family medicine programme directors and their demographic background, including gender.

Psychological and demographic factors aside, health professionals have also reported a wide range of internal and external factors that facilitate and hinder their resilience. Examples include work-intensification, challenging patients, preparation for practice, work-life balance, support from family and friends, connection with colleagues, personal characteristics (e.g. self-reflection, help seeking), and spirituality (McCann et al., 2013; Zwack and Schweitzer, 2013; Goodyear, 2014; Matheson et al., 2016; Robertson et al., 2016; Cheshire et al., 2017). However, there is a dearth of research exploring factors that medical educators identify as being related to their resilience.

This study aims to extend the medical education literature by addressing several gaps. First, of the limited research
examining medical educator resilience, none was found in the UK context and none explored resilience levels of this group in a way that would enable comparisons with other populations. Second, there are few studies exploring psychological and sociodemographic factors relating to resilience in medical educators. Finally, there is limited research exploring factors that medical educators identify as influencing their resilience across the biopsychosocial-spiritual framework (Sulmasy, 2002).

In order to address these gaps, this study first establishes baseline resilience scores of UK medical educators. It then investigates the relationships between educators’ resilience levels, their sociodemographic characteristics, and depression scores. Finally, the study examines what factors medical educators regard as being beneficial or detrimental to their own resilience. Our research questions are as follows:

RQ1: How resilient are UK medical educators, and what factors are associated with their resilience?

RQ2: What factors do medical educators perceive as promoting or undermining their resilience?

**Methods**

**Study and questionnaire design**

We adopted a pragmatic paradigm (Creswell, 2014), and designed a concurrent embedded mixed methods study to address our research questions (Creswell and Plano Clark, 2011). Here, a qualitative strand gathering educators’ views through open-ended questions, was included within a larger quantitative, cross-sectional questionnaire (Creswell and Plano Clark, 2011). The University of Dundee’s Research Ethics Committee approved this study. An anonymous, self-administered online questionnaire was employed due to its efficiency and cost-effectiveness for gathering data from eligible educators located across the UK (Boynton and Greenhalgh, 2004; Artino et al., 2014). It was developed using BOS (https://www.onlinesurveys.ac.uk), and incorporated two validated instruments, in addition to open-ended and sociodemographic questions.

The validated 25-item Connor-Davidson Resilience Scale (CD-RISC-25) was included for self-assessing resilience (Connor and Davidson, 2003). Total scores range from 0 to 100, with higher scores reflecting greater resilience (Davidson and Connor, 2015). A methodological review of 15 resilience measures identified the CD-RISC-25 as one of three instruments with the best psychometric ratings overall (Windle, Bennett and Noyes, 2011). Internal consistency in terms of Cronbach’s alpha was 0.89, and test-retest reliability 0.87 in the original validation study (Connor and Davidson, 2003). Its convergent, divergent, and construct validity have also been established (Connor and Davidson, 2003; Davidson and Connor, 2015).

The Patient Health Questionnaire-8 (PHQ-8) was used for self-reporting depressive symptoms, with scores ranging from 0 to 24 (Kroenke et al., 2009). It incorporates eight items from the PHQ-9, and is suited for self-administered questionnaires when intervention for positive responses to item nine on suicidal ideation or self-harm is precluded (Kroenke and Spitzer, 2002). Prior research has established the PHQ-8’s construct validity (Pressler et al., 2011), and internal consistency (Pressler et al., 2011; Ritter et al., 2014).

Sociodemographic details were collected to characterise our sample, as well as to explore whether any relationships existed between them and resilience. These included: (i) age, (ii) gender, (iii) race, (iv) relationship status, (v) years worked as a medical educator, (vi) professional background, and (vii) average hours worked per week. Furthermore, open-ended questions about educators’ views on resilience were incorporated (e.g. what factors enhance or undermine your resilience). Preliminary drafts of the online questionnaire were reviewed and feedback obtained from six medical educators in the development process.
Procedures and participants

Power analysis indicated a minimum required sample size of 109 (Cook and Hatala, 2015). Convenience sampling was used due to its cost-effectiveness, ease of implementation, and efficiency in achieving this sample size considering our resource constraints (Tavakol and Sandars, 2014). Initially, all UK-based medical educators enrolled on the University of Dundee’s Centre for Medical Education postgraduate programs were recruited as they were reflective of the range of educators across the medical education spectrum and across multidisciplinary backgrounds. Educators based outside of the UK, or exclusively teaching healthcare professionals other than doctors were excluded. Participants were recruited using multiple strategies that contained links to the online questionnaire: (i) e-mails, (ii) social media, (iii) e-notices, and (iv) printed notices. A participant information sheet was either distributed with the e-mails, or was accessible from the questionnaire’s front page (Sue and Ritter, 2007). Informed consent for voluntary participation was obtained electronically (World Medical Association, 2013), and no financial rewards were offered for involvement. After three months, recruitment was widened to support meeting the sample size requirement. Electronic invitations were snowballed through the Academy of Medical Educators, Association for the Study of Medical Education, National Association of Clinical Tutors UK, Scottish Medical Education Research Consortium, and University of Dundee’s School of Medicine. The data collection time frame was April to September 2016.

Quantitative analysis

Descriptive statistics were used to characterise our sample. Internal consistency of the CD-RISC-25 and PHQ-8 were evaluated using Cronbach’s alpha. The mean and standard deviation for the sample’s CD-RISC-25 scores were calculated as a measure of respondents’ resilience (Davidson and Connor, 2015). To determine which factors were associated with resilience, a multiple regression analysis was conducted using the general linear model procedure (Taylor, 2011). This examined the relationship between CD-RISC-25 score as the dependent variable, and eight independent variables (seven sociodemographic factors plus the PHQ-8 score) which were entered into the model simultaneously. This process mitigated the influence of confounding and effect modification on relationships between variables (Thompson, 2011). If certain categorical variables had less than five subjects per group, this was either combined with the ‘Other’ group if available, or collapsed together to form a new ‘Other’ group. This ensured a minimum of two subjects per variable in the model was exceeded, to allow accurate estimation of regression coefficients (Austin and Steyerberg, 2015). Given the number of comparisons conducted, a Bonferroni adjustment was also made to control the overall type I error rate (α=0.004) (Mundfrom et al., 2006). All statistical tests were performed using IBM SPSS Statistics for Windows Version 22.0 (IBM Corp., Armonk, NY, USA).

Qualitative analysis

Textual data gathered from open-ended questions were anonymised, and analysed using thematic framework analysis (Ritchie and Spencer, 1994). First, this involved familiarisation. Second, a representative data sample was used to identify major themes and subthemes. We then compared, contrasted, and negotiated identification of an initial thematic framework (LC, AD). Inductive data analysis and a deductive approach based on the biopsychosocial-spiritual model (Sulmasy, 2002) were used over five iterations before this framework was finalised. Third, the framework was employed by LC to code all the qualitative data using ATLAS.ti for Mac Version 7.0 (Scientific Software Development GmbH, Berlin, Germany). During this indexing process, any discrepancies noted between the data and framework were resolved between the authors. Fourth, the data was ‘charted’ or reorganised according to the themes and subthemes in the framework using ATLAS.ti. Finally, data patterns were mapped,
synthesised, and interpreted.

Results/Analysis

Characteristics of respondents and instrument scores

Overall, 247 educators participated, but three did not meet inclusion criteria. The final number of individuals who received the invitation was unknown because of the recruitment techniques, and thus, a response rate could not be calculated. Internal consistency (Cronbach’s alpha) for the CD-RISC-25 (0.88) and PHQ-8 (0.83) indicated adequate reliability (Lance, Butts and Michels, 2006). These values were also comparable to those reported in the literature (Connor and Davidson, 2003; Pressler et al., 2011). Sociodemographics and instrument scores for participants included in the analysis are summarised in table 1.

Table 1: Characteristics of respondents, their CD-RISC-25 and PHQ-8 scores

| Respondent characteristics (N = 244) |          |
|-------------------------------------|----------|
| **Geographic location’, no. (%)**   |          |
| England                             | 150 (61.5) |
| Northern Ireland                    | 4 (1.6)   |
| Scotland                            | 69 (28.3)  |
| Wales                               | 8 (3.3)   |
| **Gender, no. (%)**                 |          |
| Female                              | 142 (58.2) |
| Male                                | 100 (41.0) |
| Prefer not to say                   | 2 (0.8)   |
| **Age in years, no. (%)**           |          |
| 20 – 29                             | 21 (8.6)  |
| 30 – 39                             | 49 (20.1) |
| 40 – 49                             | 69 (28.3)  |
| 50 – 59                             | 74 (30.3)  |
| ≥ 60                                | 30 (12.3)  |
| Prefer not to say                   | 1 (0.4)   |
| **Race’, no. (%)**                  |          |
| Afro-Caribbean                      | 1 (0.4)   |
| Asian                               | 20 (8.2)  |
| Caucasian                           | 202 (82.8) |
| Mixed/multiple                      | 4 (1.6)   |
| Relationship status*, no. (%)   |       |
|-------------------------------|-------|
| Single                        | 16 (6.6) |
| Partnered                     | 45 (18.4) |
| Married                       | 173 (70.9) |
| Separated                     | 2 (0.8) |
| Divorced                      | 3 (1.2) |
| Widowed                       | 1 (0.4) |
| Prefer not to say             | 3 (1.2) |

| Professional background*, no. (%) |       |
|----------------------------------|-------|
| Allied health                    | 8 (3.3) |
| Dentistry                       | 4 (1.6) |
| Medicine                        | 206 (84.4) |
| Nursing                         | 8 (3.3) |
| Veterinary medicine             | 1 (0.4) |
| Other                           | 16 (6.6) |

| Years of experience as medical educator, no. (%) |       |
|-------------------------------------------------|-------|
| 0 – 4                                           | 53 (21.7) |
| 5 – 9                                           | 49 (20.1) |
| 10 – 14                                         | 48 (19.7) |
| 15 – 19                                         | 30 (12.3) |
| ≥ 20                                            | 64 (26.2) |

| Average hours worked per week*, no. (%)          |       |
|-------------------------------------------------|-------|
| ≤ 19                                            | 13 (5.3) |
| 20 – 39                                         | 42 (17.2) |
| 40 – 59                                         | 149 (61.1) |
| 60 – 79                                         | 28 (11.5) |
| ≥ 80                                            | 9 (3.7) |

| CD-RISC-25 score (n = 232)*, mean (SD)           | 72.9 (10.3) |
| PHQ-8 score (n = 236)*, mean (SD)                | 3.1 (3.5) |
RQ1: How resilient are UK medical educators, and what factors are associated with their resilience?

Participants’ CD-RISC-25 scores ranged from 42 to 98, with a mean (SD) of 72.9 (10.3) as per table 1. Their mean PHQ-8 score was 3.1, with a standard deviation of 3.5. The multiple regression analysis demonstrated that the CD-RISC-25 resilience score was significantly predicted by only the PHQ-8 depression score (B = -1.22, p < 0.001), with the model explaining 23.6% of the variance ($R^2 = 0.236$, $F(13,195) = 4.64$, $p < 0.001$). The seven sociodemographic variables were not found to be significant predictors of CD-RISC-25 score. Findings from the multiple regression analysis are summarised in table 2.

Table 2: Summary of the multiple regression analysis for variables predicting CD-RISC-25 score

| Variable                              | B (95% CI) | SE B | t     | p-value |
|---------------------------------------|------------|------|-------|---------|
| Constant                              | 72.32      | 4.11 | 17.58 | < 0.001 |
|                                       | (64.21, 80.43) |      |       |         |
| PHQ-8 score                           | -1.22      | 0.19 | -6.58 | < 0.001 |
|                                       | (-1.59, -0.86) |      |       |         |
| Age                                   | 0.29       | 0.95 | 0.30  | 0.762   |
|                                       | (-1.59, 2.17) |      |       |         |
| Average hours worked per week         | 0.50       | 0.89 | 0.56  | 0.576   |
|                                       | (-1.26, 2.27) |      |       |         |
| Years of experience as medical educator | 0.59    | 0.70 | 0.83  | 0.405   |
|                                       | (-0.80, 1.98) |      |       |         |
| Gender (ref=Male)                     |            |      |       |         |
| Female                                | 1.79       | 1.39 | 1.28  | 0.201   |
|                                       | (-0.96, 4.53) |      |       |         |
| Professional background (ref=Medicine)|            |      |       |         |
| Allied health                         | 2.30       | 3.56 | 0.64  | 0.520   |
|                                       | (-4.73, 9.32) |      |       |         |
| Nursing                               | -1.41      | 3.62 | -0.39 | 0.698   |
|                                       | (-8.55, 5.73) |      |       |         |
RQ2: What factors do medical educators perceive as promoting or undermining their resilience?

Within the qualitative data, educators mentioned two overarching themes when reflecting on factors that influenced their resilience. First, they identified internal aspects relating to the individual. This encompassed biological (e.g. health), psychological (e.g. emotional regulation), and spiritual (e.g. religion) facets:

Active, healthy lifestyle. Positive personal qualities relating to a sense of humour and positive outlook. (P #222)

Second, they highlighted external aspects relating to the socio-environmental context, including interpersonal, organisational, and societal elements:

Intimidating behaviour. Non-constructive negative feedback. Refusal to provide advice or guidance from supervisors when asked for. (P#61)

Furthermore, promoting and undermining factors largely mirrored each other. For instance, one participant highlighted her social network as building her resilience:

Supportive family & friends, especially a healthy mixture of medical and non-medical friends. (P#166)

However, strain within the social network could also undermine resilience:
...when parents get ill and take the emotional energy that I would normally use to cope with work but have to cope with looking after them instead. When my child is ill and I have to take time off work when I can see there is no spare time in my week and my colleagues have no capacity to help either. (P#92)

A key pattern that arose across the data was that resilience promoting factors were predominantly reported as being internal, for example, self-regulation of emotion as depicted by one educator:

...being present emotionally and cognitively to whatever is happening whilst being able to distance myself sufficiently from emotions to be able to regulate or play (in an improvisational sense) with them. This is what I call being empathetically mindful. (P#194)

Whereas, external aspects were mainly raised as being deleterious:

The entire system in which we work is a culture of one-up-manship and blame - particularly blaming individual junior doctors for the failure - the only feedback we receive much of the time is that we are not working fast enough. (P#198)

In addition to characterising the adversity that drained their resilience, respondents also identified that the timing and concurrence of multiple challenges were undermining:

Too much adversity in one go can overwhelm a person and leave them feeling unable to cope which undermines resilience instead of building it up. (P#208)

Discussion

To our knowledge, this is the first empirical study exploring resilience in a UK-wide cohort of medical educators. Using the CD-RISC-25, participants' resilience levels appeared to be comparable to those found in other studies conducted in the UK involving forensic and legal medicine professionals (Horvath and Massey, 2018), military personnel (Matthew et al., 2015), and adults in the general community (Petros, Opacka-Juffry and Huber, 2013). The resilience levels of respondents also appeared to be in line with U.S. populations reported in the original CD-RISC-25 validation study (Connor and Davidson, 2003). Furthermore, the average PHQ-8 score suggested that most participants were in the range representing no significant depressive symptoms (i.e. scores less than five; Kroenke et al., 2009). These findings are interesting as unlike other studies demonstrating that medical learners and practitioners might be at risk populations with higher rates of depression and other indicators of psychological distress (Dyrbye, Thomas and Shanafelt, 2006; Dyrbye et al., 2014; Hope and Henderson, 2014; Mata et al., 2015; Rotenstein et al., 2016), this study suggests that medical educators may not necessarily be at higher risk.

Increasing depressive symptoms were associated with decreasing resilience levels in medical educators. This extends the literature which has found a negative relationship between resilience and depression symptoms in other populations including healthcare professionals (Rossouw et al., 2013; Hegney et al., 2015; Shi et al., 2016). Further, these findings add to the evidence base of negative associations determined between resilience, and other facets of psychological distress such as burnout (Cooke, Doust and Steele, 2013), stress (Rahimi et al., 2014), as well as mental health problems (Peng et al., 2012) reported in the wider medical education literature.

The seven sociodemographic variables examined were not found to be significant predictors of the CD-RISC-25 score. This aligns with other work in Mexican medical students (Elizondo-Omaña et al., 2010), South African...
physicians (Rossouw et al., 2013), and in the broader U.S. population (Connor and Davidson, 2003), where no differences in mean CD-RISC-25 score were identified by the sociodemographic factors studied. Although they used the Brief Resilience Scale rather than the CD-RISC-25, Porter et al. (2018) also did not find associations between the resilience level and demographics of U.S. family medicine programme directors. However, other literature has found associations between CD-RISC-25 scores and various sociodemographic variables as summarised by Davidson and Connor (2015).

Participants identified multidimensional factors that influenced their resilience which aligns not only with Windle’s (2011) definition of resilience, but also with Sulmasy’s (2002) biopsychosocial-spiritual framework of resilience. Factors that were perceived as either promoting or undermining of resilience largely mirrored each other. Others have noted similar factors in UK healthcare professionals (Platt et al., 2015; Matheson et al., 2016), and more specifically in medical educators from a U.S. context (DeCastro et al., 2013). Our findings are also consistent with recent arguments that supportive external factors can synergistically work with individual factors to foster resilience (Balme, Gerada and Page, 2015; Matheson et al., 2016; Cheshire et al., 2017; Shanafelt and Noseworthy, 2017). Importantly, respondents mainly considered internal resources as being resilience promoting, while external factors were undermining. This pattern has not previously been described by medical educators, or to our knowledge, within the medical education literature more generally. This finding supports Hobfoll’s (2010) caution to not romanticise individual resilience, but balance this with addressing undermining issues within the external domains when developing interventions (Balme, Gerada and Page, 2015; General Medical Council, 2015b; Dyrbye, Trockel et al., 2017; Shanafelt and Noseworthy, 2017).

Limitations

There are several limitations to this study that must be considered. First, convenience sampling may have resulted in self-selection and sampling bias (Cohen, Manion and Morrison, 2011). The snowballing recruitment may have also compounded this tendency for self-selection. Therefore, it is important to cautiously consider the generalisability of the results across all UK medical educators. Additionally, the snowballing recruitment impeded our ability to calculate a response rate, and prevented data from non-responders from being considered. Nevertheless, our sample size exceeded the minimum determined by power analysis (Cook and Hatala, 2015), and we had representation from educators based in all four UK countries across multidisciplinary backgrounds. Second, the CD-RISC-25 and PHQ-8 are both retrospective, self-reporting instruments that are susceptible to recall bias. This might lead to respondents under- or over-estimating their resilience levels and depressive symptoms. Further, the PHQ-8 in its resemblance to the PHQ-9, may have been recognised as a depression screening instrument, thereby potentially influencing participants’ answers. Third, our research represents a cross-sectional snapshot of a dynamic phenomenon, meaning causal conclusions cannot be drawn. For example, an individual’s resilience may fluctuate across his or her lifetime. Finally, as with all open-ended items in questionnaire-based research, we must acknowledge the limitations for clarifying underlying meanings or reasonings behind a response.

Future directions for research

As highlighted earlier, this study provides a snapshot of medical educator resilience and depressive symptoms in the UK. First, it would be important to replicate this study on a larger scale, using random sampling techniques, and involving medical educator groups in other contexts globally to see if there are similar trends. Second, future prospective longitudinal trials investigating changes in resilience and depression symptoms over time could help determine whether causal relationships exist between these two constructs. They could also explore whether nurturing resilience may mitigate against the development of depression or other mental health conditions in this population. Furthermore, it would be important to directly compare medical educators to healthcare professionals
and learners on these measures to examine whether there is something unique about medical educators as a group. Perhaps, for instance, there are aspects of the process of becoming and/or being a medical educator that foster resilience.

Our study also draws attention to the importance of considering both external and internal factors in developing resilience. Therefore, we suggest that further research should prioritise exploring external factors, and how these play a synergistic role with internal factors.

The qualitative data gathered in this study has offered a valuable starting point for understanding the multidimensional factors educators perceive as influencing their resilience. Future research could employ semi-structured interviews to explore in greater depth how the complex interactions between internal and external factors impact resilience. It would also be important to examine the influence of contextual and sociocultural factors on resilience. Ungar (2010) argues that resilience is nested in culture. Therefore, exploring medical educator resilience across cross-cultural contexts through both quantitative and qualitative research would be valuable to help fully understand this dynamic.

Finally, it is essential to explore how medical educator resilience might influence learners. This study has highlighted that medical educators have comparable levels of resilience to other populations and they identify multidimensional factors as influencing their resilience. How this translates into the formal, informal, and hidden curricula is worthy of further exploration.

**Conclusion**

This study adds to the sparse research relating to medical educators globally. In particular, it examines resilience in a cohort of UK medical educators which has been previously unexplored. Participants’ resilience levels were found to be comparable to other population samples. A negative association between depressive symptoms and resilience levels was identified, although further research is needed to clarify this relationship.

Educators reported multidimensional factors that influenced their resilience. However, they predominately viewed internal factors as being supportive, and external factors as undermining. This study highlights the importance of considering contextual and sociocultural influences, alongside individual aspects when addressing resilience in the medical education community. Finally, it raises questions for further exploration about how medical educator resilience might influence the resilience of learners.

**Take Home Messages**

- Medical educators’ resilience levels were found to be comparable to other population samples, and only depressive symptoms were found to be negatively associated with resilience levels.
- Educators perceived multidimensional influences on their own resilience, but predominately viewed internal factors as being supportive, and external factors as undermining.
- This study highlights the importance of considering external factors, such as contextual and sociocultural influences, in addition to individual factors when addressing resilience.
- Further research is needed to explore the external factors impacting resilience, and how medical educator resilience may influence learners through the formal, informal, and hidden curricula.
Notes On Contributors

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Bibliography/References

Abaza, M. M. and Nelson, K. G. (2018) 'Leading by Example: Role Modeling Resilience Helps Our Learners and Ourselves', Academic Medicine, 93(2), pp. 157-158. https://doi.org/10.1097/acm.0000000000001936

Aburn, G., Gott, M. and Hoare, K. (2016) 'What is resilience? An Integrative Review of the empirical literature', Journal of Advanced Nursing, 72(5), pp. 980-1000. https://doi.org/10.1111/jan.12888

Artino, A. R., Jr., La Rochelle, J. S., Dezee, K. J. and Gehlbach, H. (2014) 'Developing questionnaires for educational research: AMEE Guide No. 87', Medical Teacher, 36, pp. 463-474. https://doi.org/10.3109/0142159X.2014.889814

Austin, P. C. and Steyerberg, E. W. (2015) 'The number of subjects per variable required in linear regression analyses', Journal of Clinical Epidemiology, 68(6), pp. 627-636. https://doi.org/10.1016/j.jclinepi.2014.12.014

Bacchi, S. and Licinio, J. (2017) 'Resilience and Psychological Distress in Psychology and Medical Students', Academic Psychiatry, 41(2), pp. 185-188. https://doi.org/10.1007/s40596-016-0488-0

Balme, E., Gerada, C. and Page, L. (2015) 'Doctors need to be supported, not trained in resilience', BMJ, 351, pp. h4709. https://doi.org/10.1136/bmj.h4709

Boynton, P. M. and Greenhalgh, T. (2004) 'Selecting, designing, and developing your questionnaire', BMJ, 328(7451), pp. 1312-1315. https://doi.org/10.1136/bmj.328.7451.1312

Cheshire, A., Ridge, D., Hughes, J., Peters, D., et al. (2017) 'Influences on GP coping and resilience: a qualitative study in primary care', British Journal of General Practice, 67(659), pp. e428-e436. https://doi.org/10.3399/bjgp17X690893
Cohen, L., Manion, L. and Morrison, K. (2011) *Research Methods in Education*. 7th edn. London: Routledge.

Connor, K. M. and Davidson, J. R. (2003) 'Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC)', *Depression and Anxiety*, 18(2), pp. 76-82. [https://doi.org/10.1002/da.10113](https://doi.org/10.1002/da.10113)

Cook, D. A. and Hatala, R. (2015) 'Got power? A systematic review of sample size adequacy in health professions education research', *Advances in health sciences education: theory and practice*, 20(1), pp. 73-83. [https://doi.org/10.1007/s10459-014-9509-5](https://doi.org/10.1007/s10459-014-9509-5)

Connor, K. M. and Davidson, J. R. (2003) 'Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC)', *Depression and Anxiety*, 18(2), pp. 76-82. [https://doi.org/10.1002/da.10113](https://doi.org/10.1002/da.10113)

Cooke, G. P., Doust, J. A. and Steele, M. C. (2013) 'A survey of resilience, burnout, and tolerance of uncertainty in Australian general practice registrars', *BMC Medical Education*, 13, p. 2. [https://doi.org/10.1186/1472-6920-13-2](https://doi.org/10.1186/1472-6920-13-2)

Cora-Bramble, D., Zhang, K. and Castillo-Page, L. (2010) 'Minority faculty members' resilience and academic productivity: are they related?', *Academic Medicine*, 85(9), pp. 1492-1498. [https://doi.org/10.1097/ACM.0b013e3181df12a9](https://doi.org/10.1097/ACM.0b013e3181df12a9)

Creswell, J. W. (2014) *Research design: qualitative, quantitative, and mixed methods approaches*. 4th edn. Thousand Oaks, California: SAGE Publications.

Creswell, J. W. and Plano Clark, V. L. (2011) *Designing and conducting mixed methods research*. 2nd edn. Los Angeles: SAGE Publications.

Cruess, S. R., Cruess, R. L. and Steinert, Y. (2008) 'Role modelling--making the most of a powerful teaching strategy', *BMJ*, 336(7646), pp. 718-721. [https://doi.org/10.1136/bmj.39503.757847.BE](https://doi.org/10.1136/bmj.39503.757847.BE)

Davidson, J. R. T. and Connor, K. M. (2015) *Connor-Davidson Resilience Scale (CD-RISC) Manual*. Unpublished.

DeCastro, R., Sambuco, D., Ubel, P. A., Stewart, A., et al. (2013) 'Batting 300 is good: perspectives of faculty researchers and their mentors on rejection, resilience, and persistence in academic medical careers', *Academic Medicine*, 88(4), pp. 497-504. [https://doi.org/10.1097/ACM.0b013e318285f3c0](https://doi.org/10.1097/ACM.0b013e318285f3c0)

Dyrbye, L. N., Shanafelt, T. D., Werner, L., Sood, A., et al. (2017) 'The Impact of a Required Longitudinal Stress Management and Resilience Training Course for First-Year Medical Students', *Journal of General Internal Medicine*, 32(12), pp. 1309-1314. [https://doi.org/10.1007/s11606-017-4171-2](https://doi.org/10.1007/s11606-017-4171-2)

Dyrbye, L. N., Thomas, M. R. and Shanafelt, T. D. (2006) 'Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students', *Academic Medicine*, 81, pp. 354-373. [https://doi.org/10.1097/00001888-200604000-00009](https://doi.org/10.1097/00001888-200604000-00009)

Dyrbye, L. N., Trockel, M., Frank, E., Olson, K., et al. (2017) 'Development of a Research Agenda to Identify Evidence-Based Strategies to Improve Physician Wellness and Reduce Burnout', *Annals of Internal Medicine*, 166(10), pp. 743-744. [https://doi.org/10.7326/M16-2956](https://doi.org/10.7326/M16-2956)

Dyrbye, L. N., West, C. P., Satele, D., Boone, S., et al. (2014) 'Burnout among U.S. medical students, residents, and early career physicians relative to the general U.S. population', *Academic Medicine*, 89(3), pp. 443-451. [https://doi.org/10.1097/ACM.0000000000000134](https://doi.org/10.1097/ACM.0000000000000134)

Eley, D. S., Leung, J. K., Campbell, N. and Cloninger, C. R. (2017) 'Tolerance of ambiguity, perfectionism and resilience are associated with personality profiles of medical students oriented to rural practice', *Medical Teacher*, 39(5), pp. 512-519. [https://doi.org/10.1080/0142159X.2017.1297530](https://doi.org/10.1080/0142159X.2017.1297530)

Elizondo-Omaña, R. E., García-Rodríguez Mde, L., Hinojosa-Amaya, J. M., Villarreal-Silva, E. E., et al. (2010) 'Resilience does not predict academic performance in gross anatomy', *Anatomical Sciences Education*, 3(4), pp. 168-173. [https://doi.org/10.1002/ase.158](https://doi.org/10.1002/ase.158)
General Medical Council. (2015a) *Promoting excellence: standards for medical education and training*. Manchester (UK): General Medical Council. Available at: http://www.gmc-uk.org/Promoting_excellence_standards_for_medical_education_and_training_0715.pdf_6193916_5.pdf (Accessed: 10 January 2019).

General Medical Council. (2015b) *Building a supportive environment: a review to tackle undermining and bullying in medical education and training*. Manchester (UK): General Medical Council. Available at: http://www.gmc-uk.org/Under_embargo_05_03_15_Building_a_supportive_environment.pdf_59988406.pdf (Accessed: 10 January 2019).

Goodyear, H. M. (2014) 'First year doctors experience of work related wellbeing and implications for educational provision', *International Journal of Medical Education*, 5, pp. 103-109. https://doi.org/10.5116/ijme.5380.6ef1

Haglund, M. E., aan het Rot, M., Cooper, N. S., Nestadt, P. S., *et al.* (2009) 'Resilience in the third year of medical school: a prospective study of the associations between stressful events occurring during clinical rotations and student well-being', *Academic Medicine*, 84(2), pp. 258-268. https://doi.org/10.1097/ACM.0b013e31819381b1

Hegney, D. G., Rees, C. S., Eley, R., Osseiran-Moisson, R., *et al.* (2015) 'The contribution of individual psychological resilience in determining the professional quality of life of Australian nurses', *Frontiers in Psychology*, 6, pp. 1613. https://doi.org/10.3389/fpsyg.2015.01613

Hobfoll, S. E. (2010) 'Conservation of Resources Theory: Its Implication for Stress, Health, and Resilience', in Folkman, S. (ed) *The Oxford Handbook of Stress, Health, and Coping*. Oxford: Oxford University Press, pp. 127–144. https://doi.org/10.1093/oxfordhb/9780195375343.013.0007

Hope, V. and Henderson, M. (2014) 'Medical student depression, anxiety and distress outside North America: a systematic review', *Medical Education*, 48(10), pp. 963-979. https://doi.org/10.1111/medu.12512

Horvath, M. A. H. and Massey, K. (2018) 'The impact of witnessing other people's trauma: The resilience and coping strategies of members of the Faculty of Forensic and Legal Medicine', *Journal of Forensic and Legal Medicine*, 55, pp. 99-104. https://doi.org/10.1016/j.jflm.2018.02.012

Houpy, J. C., Lee, W. W., Woodruff, J. N. and Pincavage, A. T. (2017) 'Medical student resilience and stressful clinical events during clinical training', *Medical Education Online*, 22(1), pp. 1320187. https://doi.org/10.1080/10872981.2017.1320187

Howe, A., Smajdor, A. and Stockl, A. (2012) 'Towards an understanding of resilience and its relevance to medical training', *Medical Education*, 46, pp. 349-356. https://doi.org/10.1111/j.1365-2923.2011.04188.x

Kroenke, K. and Spitzer, R. L. (2002) 'The PHQ-9: A new depression diagnostic and severity measure', *Psychiatric Annals*, 32(9), pp. 509-515. https://doi.org/10.3928/0048-5713-20020901-06

Kroenke, K., Strine, T. W., Spitzer, R. L., Williams, J. B. W., *et al.* (2009) 'The PHQ-8 as a measure of current depression in the general population', *Journal of Affective Disorders*, 114(1), pp. 163-173. https://doi.org/10.1016/j.jad.2008.06.026

Lance, C. E., Butts, M. M. and Michels, L. C. (2006) 'The Sources of Four Commonly Reported Cutoff Criteria', *Organizational Research Methods*, 9(2), pp. 202-220. https://doi.org/10.1177/1094428105284919

Luthar, S. S., Cicchetti, D. and Becker, B. (2000) 'The construct of resilience: a critical evaluation and guidelines for future work', *Child Development*, 71(3), pp. 543-562. https://doi.org/10.1111/1467-8624.00164

Mata, D. A., Ramos, M. A., Bansal, N., Khan, R., *et al.* (2015) 'Prevalence of Depression and Depressive Symptoms among Medical Students in Portugal: A Cross Sectional Study', *Frontiers in Psychology*, 6, pp. 1147. https://doi.org/10.3389/fpsyg.2015.01147

Luthar, S. S., Cicchetti, D. and Becker, B. (2000) 'The construct of resilience: a critical evaluation and guidelines for future work', *Child Development*, 71(3), pp. 543-562.
Among Resident Physicians: A Systematic Review and Meta-analysis’, *JAMA*, 314(22), pp. 2373-2383. https://doi.org/10.1001/jama.2015.15845

Matheson, C., Robertson, H. D., Elliott, A. M., Iversen, L., *et al.* (2016) ‘Resilience of primary healthcare professionals working in challenging environments: a focus group study’, *British Journal of General Practice*, 66(648), pp. e507-515. https://doi.org/10.3399/bjgp16X685285

Matthew, G., Meek, D., Gibbs, T., Sawford, H., *et al.* (2015) ‘What are the psychological effects of delivering and receiving “high-risk” survival resistance training?’, *Military Medicine*, 180(2), pp. 168-177. https://doi.org/10.7205/MILMED-D-14-00285

McCann, C. M., Beddoe, E., McCormick, K., Huggard, P., *et al.* (2013) ‘Resilience in the health professions: A review of recent literature’, *International Journal of Wellbeing*, 3(1), pp. 60-81.

Mundfrom, D. J., Perrett, J. J., Schaffer, J., Piccone, A., *et al.* (2006) ‘Bonferroni adjustments in tests for regression coefficients’, *Multiple Linear Regression Viewpoints*, 32(1), pp. 1-6.

Oliveira, A. C. P. M., Machado, A. P. G. M. and Aranha, R. N. M. (2017) ‘Identification of factors associated with resilience in medical students through a cross-sectional census’, *BMJ Open*, 7(11), pp. e017189. https://doi.org/10.1136/bmjopen-2017-017189

Olson, K., Kemper, K. J. and Mahan, J. D. (2015) ‘What factors promote resilience and protect against burnout in first-year pediatric and medicine-pediatric residents?’, *Journal of Evidence-Based Complementary & Alternative Medicine*, 20(3), pp. 192-198.

Panagioti, M., Panagopoulou, E., Bower, P., Lewith, G., *et al.* (2017) ‘Controlled Interventions to Reduce Burnout in Physicians: A Systematic Review and Meta-analysis’, *JAMA Internal Medicine*, 177(2), pp. 195-205. https://doi.org/10.1001/jamainternmed.2016.7674

Peng, L., Zhang, J., Li, M., Li, P., *et al.* (2012) ‘Negative life events and mental health of Chinese medical students: the effect of resilience, personality and social support’, *Psychiatry Research*, 196(1), pp. 138-141. https://doi.org/10.1016/j.psychres.2011.12.006

Petros, N., Opacka-Juffry, J. and Huber, J. H. (2013) ‘Psychometric and neurobiological assessment of resilience in a non-clinical sample of adults’, *Psychoneuroendocrinology*, 38(10), pp. 2099-2108. https://doi.org/10.1016/j.psyneuen.2013.03.022

Platt, D., Chinn, J., Scallan, S. and Lyon-Maris, J. (2015) ‘Fostering resilience with GPs: a workshop approach’, *Education for Primary Care*, 26(5), pp. 328-331. https://doi.org/10.1080/14739879.2015.1084795

Porter, M., Hagan, H., Klassen, R., Yang, Y., *et al.* (2018) ‘Burnout and Resiliency Among Family Medicine Program Directors’, *Family Medicine*, 50(2), pp. 106-112. https://doi.org/10.22454/FamMed.2018.836595

Pressler, S. J., Subramanian, U., Perkins, S. M., Gradus-Pizlo, I., *et al.* (2011) ‘Measuring depressive symptoms in heart failure: validity and reliability of the patient health questionnaire-8’, *American Journal of Critical Care*, 20(2), pp. 146-152. https://doi.org/10.4037/ajcc2010931

Rahimi, B., Baetz, M., Bowen, R. and Balbuena, L. (2014) ‘Resilience, stress, and coping among Canadian medical students’, *Canadian Medical Education Journal*, 5(1), pp. e5-e12. PMID: 26451221.

Ritchie, J. and Spencer, L. (1994) ‘Qualitative data analysis for applied policy research’, in Bryman, A. and Burgess, R. (eds) *Analysing qualitative data*. London: Routledge, pp. 173–194.

Ritter, P. L., Ory, M. G., Laurent, D. D. and Lorig, K. (2014) ‘Effects of chronic disease self-management programs...
for participants with higher depression scores: secondary analyses of an on-line and a small-group program', *Translational Behavioral Medicine*, 4(4), pp. 398-406. https://doi.org/10.1007/s13142-014-0277-9

Robertson, H. D., Elliott, A. M., Burton, C., Iversen, L., *et al.* (2016) 'Resilience of primary healthcare professionals: a systematic review', *British Journal of General Practice*, 66(647), pp. e423-433. https://doi.org/10.3399/bjgp16X685261

Rogers, D. (2016) 'Which educational interventions improve healthcare professionals' resilience?', *Medical Teacher*, 38(12), pp. 1236-1241. https://doi.org/10.1080/0142159X.2016.1210111

Rossouw, L., Seedat, S., Emsley, R. A., Suliman, S., *et al.* (2013) 'The prevalence of burnout and depression in medical doctors working in the Cape Town Metropolitan Municipality community healthcare clinics and district hospitals of the Provincial Government of the Western Cape: a cross-sectional study', *South African Family Practice*, 55(6), pp. 567-573. https://doi.org/10.1080/20786204.2013.10874418

Rottenstein, L. S., Ramos, M. A., Torre, M., Segal, J. B., *et al.* (2016) 'Prevalence of Depression, Depressive Symptoms, and Suicidal Ideation Among Medical Students: A Systematic Review and Meta-Analysis', *JAMA*, 316(21), pp. 2214-2236. https://doi.org/10.1001/jama.2016.17324

Shanafelt, T. D., Balch, C. M., Bechamps, G., Russell, T., *et al.* (2010) 'Burnout and medical errors among American surgeons', *Annals of Surgery*, 251(6), pp. 995-1000. https://doi.org/10.1097/SLA.0b013e3181e1bfdb

Shanafelt, T. D., Balch, C. M., Dyrbye, L., Bechamps, G., *et al.* (2011) 'Special report: suicidal ideation among American surgeons', *Archives of Surgery*, 146(1), pp. 54-62. https://doi.org/10.1001/archsurg.2010.292

Shanafelt, T. D., Bradley, K. A., Wipf, J. E. and Back, A. L. (2002) 'Burnout and self-reported patient care in an internal medicine residency program', *Annals of Internal Medicine*, 136(5), pp. 358-367. https://doi.org/10.7326/0003-4819-136-5-200203050-00008

Shanafelt, T. D. and Noseworthy, J. H. (2017) 'Executive Leadership and Physician Well-being: Nine Organizational Strategies to Promote Engagement and Reduce Burnout', *Mayo Clinic Proceedings*, 92(1), pp. 129-146. https://doi.org/10.1016/j.mayocp.2016.10.004

Shi, M., Liu, L., Wang, Z. Y. and Wang, L. (2016) 'Prevalence of depressive symptoms and its correlations with positive psychological variables among Chinese medical students: an exploratory cross-sectional study', *BMC Psychiatry*, 16, pp. 3. https://doi.org/10.1186/s12888-016-0710-3

Sood, A., Prasad, K., Schroeder, D. and Varkey, P. (2011) 'Stress Management and Resilience Training Among Department of Medicine Faculty: A Pilot Randomized Clinical Trial', *Journal of General Internal Medicine*, 26(8), pp. 858-861. https://doi.org/10.1007/s11606-011-1640-x

Sood, A., Sharma, V., Schroeder, D. R. and Gorman, B. (2014) 'Stress Management and Resiliency Training (SMART) Program among Department of Radiology Faculty: A Pilot Randomized Clinical Trial', *Explore: The Journal of Science and Healing*, 10(6), pp. 358-363. https://doi.org/10.1016/j.explore.2014.08.002

Southwick, S. M. and Charney, D. S. (2012) *Resilience: The Science of Mastering Life's Greatest Challenges*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139013857

Sue, V. M. and Ritter, L. A. (2007) *Conducting Online Surveys*. Los Angeles: SAGE Publications, Inc. https://doi.org/10.4135/9781412983754

Sulmasy, D. P. (2002) 'A biopsychosocial-spiritual model for the care of patients at the end of life', *Gerontologist*, 42 Spec No 3, pp. 24-33. https://doi.org/10.1093/geront/42.suppl_3.24
Tavakol, M. and Sandars, J. (2014) 'Quantitative and qualitative methods in medical education research: AMEE Guide No 90: Part II', Medical Teacher, 36(10), pp. 838-848. https://doi.org/10.3109/0142159X.2014.915297

Taylor, A. (2011) Using the GLM Procedure in SPSS, Macquarie University, pp. 106-112. Available at: www.psy.mq.edu.au/psystat/documents/GLMSPSS.pdf (Accessed: 10 January 2019).

Tempski, P., Santos, I. S., Mayer, F. B., Enns, S. C., et al. (2015) 'Relationship among Medical Student Resilience, Educational Environment and Quality of Life', PLoS One, 10(6), pp. e0131535. https://doi.org/10.1371/journal.pone.0131535

Thompson, C. B. (2011) Confounding and Effect Modification [PowerPoint PDF handout], Johns Hopkins University. Available at: https://ictr.johnshopkins.edu/wp-content/uploads/import/1305-Thompson%20Confounding.pdf (Accessed: 10 January 2019).

Ungar, M. (2010) 'Cultural Dimensions of Resilience among Adults', in Reich, J. W., Zautra, A. J. and Hall, J. S. (eds) Handbook of Adult Resilience. New York: Guilford Press, pp. 404-423.

West, C. P., Dyrbye, L. N. and Shanafelt, T. D. (2018) 'Physician burnout: contributors, consequences and solutions', Journal of Internal Medicine, 283(6), pp. 516-529. https://doi.org/10.1111/joim.12752

West, C. P., Huschka, M. M., Novotny, P. J., Sloan, J. A., et al. (2006) 'Association of perceived medical errors with resident distress and empathy: a prospective longitudinal study', JAMA, 296(9), pp. 1071-1078. https://doi.org/10.1001/jama.296.9.1071

Windle, G. (2011) 'What is resilience? A review and concept analysis', Reviews in Clinical Gerontology, 21(02), pp. 152-169. https://doi.org/10.1071/RC10036

Windle, G., Bennett, K. M. and Noyes, J. (2011) 'A methodological review of resilience measurement scales', Health and Quality of Life Outcomes, 9, pp. 8. https://doi.org/10.1186/1477-7525-9-8

World Medical Association. (2013) 'World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects', JAMA, 310(20), pp. 2191-2194. https://doi.org/10.1001/jama.2013.281053

Zwack, J. and Schweitzer, J. (2013) 'If every fifth physician is affected by burnout, what about the other four? Resilience strategies of experienced physicians', Academic Medicine, 88(3), pp. 382-389. https://doi.org/10.1097/ACM.0b013e318281696b

Appendices

None.

Declarations

The author has declared that there are no conflicts of interest.

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