



Predicting stress and mental wellbeing among doctoral researchers

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Predicting stress and mental wellbeing among Doctoral researchers

Abstract

Background

Although mental health in Higher Education is increasingly recognised as a public health issue, postgraduate research students are often overlooked. Recent studies indicate a high prevalence of mental distress in this population.

Aims

This study assesses the experience of doctoral researchers and identifies factors influencing mental wellbeing and perceived stress.

Methods

A cross-sectional study examined how key demographic, individual and contextual factors relate to stress and mental wellbeing in a sample of 431 doctoral researchers in the United Kingdom.

Results

Respondents gave positive reports about their supervisory relationship and identified feeling confidently prepared for their work. Family support, good general health, sleep and low levels of self-depreciation predicted stronger mental wellbeing and lower levels of stress. Students who were confident about their future career and felt well prepared for their studies were less stressed and those who were achievement orientated had better mental wellbeing.

Conclusions

Focused attention on exploring career options and building confidence may help reduce stress among doctoral researchers. Taking steps to tackle the imposter phenomenon may help further. These could include addressing fear of failure, improving confidence in

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3 research ability and clarifying the role of doctoral researchers within the wider academic
4 community.
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7 Keywords: mental wellbeing; postgraduate research; higher education; student mental health;
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9 doctoral researchers; imposter phenomenon
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Introduction

Internationally mental health in Higher Education is becoming recognised as an important public health issue (Orygen, 2017; Beckett et al, 2018; American College Health Association, 2018; Brown, 2016). In the U.K. substantive effort has been directed towards addressing student mental health, including national policy frameworks (Universities UK, 2017; Hughes & Spanner, 2019) and targeted funding from the Government's Office for Students. These activities are taking place despite a paucity of data to inform our understanding of student mental health (Brown, 2018; Barkham et al., 2019).

In the U.K. there are approximately 100,000 postgraduate research students completing doctoral research (HESA, 2020). While the mental health of these students has often been overlooked, recent studies have indicated a high prevalence of mental distress (Levecque et al., 2017; Panger et al., 2014; Evans et al., 2018). We sought to identify factors contributing to stress and mental wellbeing among doctoral researchers. We started with a review of the literature, summarised below, which identified factors influencing mental wellbeing including; social support, academic support, role clarity, an individual's academic engagement, self-depreciation, financial security, physical health, sleep, career confidence, supervisory relationship and living conditions. Multiple regression analysis was used to compare how these factors in combination relate to stress and mental wellbeing.

Review of factors influencing doctoral researchers' mental wellbeing

Undertaking a PhD is often perceived as challenging. The language used normalises stress, e.g., 'surviving' the doctoral degree and 'staying sane,' creating a culture in which sustained mental effort and long working hours are accepted (Metcalf

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3 et al., 2018). This leads to conflicts between work and personal or family time (Metcalf
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5 et al., 2018; Sverdlik et al., 2018).
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8 For many, this is a time of transition where the need and ability to manage work
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10 independently changes (Turner & McAlpine, 2011; Gardner, 2007). Uncertainty is
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12 inherent in this constantly evolving role (Gardner, 2007; Laudel & Gläser, 2008). It is
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14 common for students to feel like an imposter (Parkman 2016; Baldwin et al., 2014),
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16 attributing success to external factors and feeling like a fraud (Clance & Imes, 1978).
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18 Weak work-related boundaries and unclear expectations can contribute to the imposter
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20 phenomenon (Crumpacker & Crumpacker, 2007; Hutchins, 2015; Kets de Vries, 2005;
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22 Vergauwe et al., 2014).
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27 Social support is a predictor of doctoral researchers' wellbeing (Panger et al.,
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29 2014) and socialising within the academic community is an important element of
30
31 academic success (Gardner, 2007). However, building this support network is not always
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33 easy. Independent study, a common necessity for postgraduate research students, can lead
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35 to isolation (Ali & Kohun, 2009; Deem & Brehony, 2000; Janta et al., 2014). Further,
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37 while some students find the academic community to be a source of empowerment,
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39 enthusiasm and inspiration, others experience it as a source of burden (Stubb et al., 2011).
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44 Engaging with the academic community may be challenging, in part, because
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46 students are unsure of their place. One doctoral student has described the experience of
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48 many; "there are times when I feel as if I am living in the uncomfortable skin of someone
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50 who is seeking validation for the right to grace the halls of academia" (Mason, 2009,
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52 p.17). Students are unsure if they will work in this community; analysis of the Destination
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54 of Leavers of Higher Education Longitudinal Survey indicates that only 30% of doctoral
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56 researchers have an academic or research role within the Higher Education sector three
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3 and a half years after graduating (Hancock, 2020). Focusing on, and working towards, a
4 career outside of academia is linked to higher levels of mental wellbeing (Levecque et al.,
5 2017; Panger et al., 2014).
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10 Finances and health are likely to impact doctoral researchers' mental wellbeing.
11 The cost of living is commonly a challenge for doctoral researchers (e.g., Panger et al.,
12 2014; Metcalfe et al., 2018). Financial strain is universally associated with depression and
13 anxiety (Meltzer et al., 2012; Fitch et al., 2011). In the general population, housing quality
14 is positively associated with psychological wellbeing (Evans et al., 2003) and individuals
15 living in poor housing conditions are more likely to experience mental health problems
16 (Pevalin et al., 2008). Postgraduate research students often neglect their physical health
17 (Rizzolo et al., 2016) and are likely to be getting insufficient sleep (Panger et al., 2014;
18 Levecque et al., 2017). As mental health problems are more common in those with poor
19 physical health (McManus et al., 2016) and sleep is important for mental wellbeing
20 (Robotham et al., 2011), these factors may have a substantive influence on mental
21 wellbeing and stress for doctoral researchers.
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39 Many of the factors outlined may be influenced by the supervisory relationship.
40 Substantive expectations are placed on supervisors, with a supervisor being expected to
41 be the student's primary source of support (Lovitts, 2002). The quality of the relationship
42 with a supervisor is central to the doctoral experience and the student's wellbeing (e.g.,
43 Cowling, 2017; Metcalfe et al., 2018). While some studies suggest that most students feel
44 positive about their supervisor (Metcalfe et al., 2018; Panger et al., 2014), others have
45 identified problems (Martinez et al., 2013; Schmidt & Umans, 2014).
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56 In this study, we aimed to assess how these different facets of the doctoral
57 researcher experience, in combination, influence mental wellbeing and perceived stress.
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Methods

Ethical approval

Ethical approval was received on the 10th of July 2018 under the reference LRS-17/18-6731. All participants have given consent for their data to be used in the research.

Design and procedure

Supplementing the literature review, two co-creation panels were run at Derby University (N=9; 3 males, 6 females) and King's College London (N=8; 3 males, 5 females). These universities allowed us to capture diversity of experience. In 2018/19 Derby University enrolled 260 doctoral researchers, compared with 2,615 at King's (HESA, 2020). All members of the co-creation panels at King's had funding, primarily through Doctoral Training Partnerships. Several members of the panel at Derby University were self-funding and two were funded through industry placements. Themes of the doctoral experience were discussed with the panels to check that central elements of the experience had not been overlooked.

Using a cross-sectional design, a convenience sample of doctoral researchers was recruited from 48 universities in the U.K. between August 2018 and March 2019. Recruitment was primarily facilitated via social media. Adverts were also placed in institutional research recruitment circulars at King's College London and Derby University. The survey was hosted online and took 25 minutes to complete.

Measures

The survey included items relating to demographics (age, gender, ethnicity, sexuality) and student status (university of study, format and subject of study and student status, i.e., home, EU or international student). The survey included 24 single items, measured on a

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2
3 7-point Likert scale (strongly agree - strongly disagree). These items, listed in Table 2,
4
5 were developed through discussion of literature review with our co-creation panels.
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7 Where practical, items were aligned with those used in the Berkeley Graduate Student
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9 Happiness and Well-being Report (Panger et al., 2014) to facilitate international
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11 comparison. We assessed achievement orientation, social support, health, perceived
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13 stress, mental wellbeing and self-depreciation using pre-validated scales.
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16 17 *Perceived stress*

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20 Perceived stress refers to the degree to which life events are subjectively appraised as
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22 stressful in relation to the perceived availability of resources needed to cope (Lazarus &
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24 Folkman, 1984). We used the four-item version of the Perceived Stress Scale (Cohen et
25
26 al., 1983), scored on a 5-point scale (never – very often), with higher scores indicating
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28 more stress (range 0-16). This has been used within the student population and has
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30 comparable reliability ($\alpha = 0.77$) to the longer forms (Cohen, 1988; Warrtigh et al., 2013).
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34 35 *Mental wellbeing*

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38 Mental wellbeing, also referred to as subjective wellbeing (Diener, 1984) or positive
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40 mental health (Tennant et al., 2007), acts as a positive and protective factor in regulating
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42 physical and mental health (Lamers, 2012). The 7-item Short Warwick Edinburgh Mental
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44 Wellbeing Scale (SWEMWBS; Stewart-Brown et al., 2009) was used. Participants rate
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46 items on a 5-point Likert scale (none of the time – all of the time). Total scores range
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48 from 7 to 35, with higher scores indicating better mental well-being. This scale has been
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50 recommended for use within the student population (Barkham et al., 2019). The scale has
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52 satisfactory internal consistency ($\alpha = .84$ to $.86$).
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56 57 *Self-depreciation*

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3 Impostor syndrome was assessed using the 5-item self-depreciation subscale on the
4 Perceived Fraudulence Scale (PFS; Kolligian Jr & Sternberg, 1991). Items are measured
5 on a 7-point Likert scale (strongly disagree – strongly agree). Higher scores indicate
6 higher self-depreciation (range 5-35). The scale, developed for university students,
7 measures perceived experiences of intellectual and professional fraudulence. The scale
8 displays good internal consistency ($\alpha = .95$) and criterion validity through strong positive
9 correlations with the Harvey Impostor Phenomenon Scale ($r = .83$), Clance Impostor
10 Phenomenon Scale ($r = .78$) and Leary Impostorism Scale ($r = .70$ to $.80$; Mak et al.,
11 2019).
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24 *Social Support*

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27 The 12-item Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al.,
28 1988) was used to assess social support. Items are measured on a 7-point Likert scale
29 (strongly disagree – strongly agree). Higher scores indicate stronger social support.
30 Subscales, measuring support received from a significant other, family and friends, have
31 good internal consistency ($\alpha = .91$ to $.95$) and high test-retest reliability ($r = .85$; e.g.
32 Bohadana et al., 2019).
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42 *Health*

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45 Respondents were asked for the average number of hours they slept per night over the
46 last week. Respondents rated their 'overall health' for the semester on a 5-point scale
47 (very good – very poor). Lower scores indicated better overall health.
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52 We used a single item measure of vigorous physical activity, taken from the Youth
53 Risk Behaviour Surveillance System (CDC, 1999). Vigorous physical activity may be
54 more precisely measured than moderate physical activity (Butler et al., 2004). Participants
55 were asked to state the number of days they had engaged in cardio exercise for at least 20
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3 minutes in the past 7 days. Engagement in physical activity was set at > 3 days and
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5 physical inactivity was set at < 3 days (VanKim & Nelson, 2013).
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8 *Achievement Orientation*

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11 To assess motivation, enthusiasm and preparation for academic work, we used the 10-
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13 item Achievement Orientation Scale, from the Berkeley Report (Panger et al., 2014).
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15 Each item was measured on a 7-point Likert scale (strongly disagree – strongly agree). A
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17 higher total score indicates stronger motivation and readiness for academic work (range
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19 10 - 70).
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23 **3.3. Sample**

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26 Respondents who were not doctoral researchers at UK universities were excluded (N =
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28 44), resulting in a sample of 431 participants (see Table 1). A broad range of subject
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30 areas was represented. Given the high proportion of respondents from schools of
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32 Psychology, Psychiatry and Neurosciences (PPN), we have separated this as an
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34 independent category. At the ethnic diversity of this sample was limited, Black, Asian
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36 and Minority Ethnic (BAME) respondents have been grouped together.
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40 **Data analysis**

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43 Our survey included 24 single-item measures and we used factor analysis to assess
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45 whether clusters of items could form distinct subscales. Multiple regression analysis was
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47 completed to predict mental wellbeing and, separately, perceived stress.
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51 **Results**

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54 As summarised in Table 2, doctoral researchers reported positive experiences, with
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56 respondents identifying that they were on track with their studies, were well prepared to
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58 complete their programme, and understood the work they were doing. Most respondents
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3 reported that they had a good academic support network and a positive relationship with
4 their supervisor. Almost all respondents felt safe on campus and where they lived. Despite
5 this, there were some areas of substantial concern, including confidence around future
6 career.
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13 The reliability of the scales used in the survey was tested and internal consistency
14 was high for each of the scales; perceived stress ($\alpha = .78$), SWEMWBS ($\alpha = .87$), self-
15 depreciation ($\alpha = .86$) and achievement orientation ($\alpha = .84$). Mean scores on the key
16 scales were: perceived stress = 11.83 (SD = 3.14); SWEMWBS = 20.22 (SD = 3.78);
17 Self-depreciation = 21.70 (SD = 7.31) and Achievement Orientation = 45.71 (SD = 9.87).
18 A quarter of respondents identified low levels of mental wellbeing (scoring less than 18),
19 indicative of probable depression or anxiety (Warwick Medical School, 2020). Just over
20 half of participants (54%) reported engaging in vigorous physical activity more than 3
21 times a week. On average, participants reported sleeping between 6 – 7 hours a night.
22 Over half (59%) of respondents reported poor or very poor overall health while 14%
23 reported good and 4% reported very good overall health.
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39 *Factor Analysis*

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41 The factorability of the 24 individual, Likert scale, items was examined. Through initial
42 assessment, two items had low extracted communalities and were removed from
43 subsequent analysis (Mindset: not engaged, .005; Mindset: Space and Resources, .038).
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49 The factorability of the remaining 22 items was acceptable¹.
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57 ¹ The Kaiser-Meyer-Olkin measure of sampling adequacy was .84. Bartlett's test of
58 sphericity was significant ($\chi^2(231) = 3479.63, p < .001$). The diagonals of the anti-image
59 correlation matrix were over .5. The extracted communalities were above .2.
60

Principal axis factoring was used to identify underlying factors. Six factors had an eigen value of greater than one. Further, the scree plot levelled off after six factors. Solutions for four, five, six factors were each examined. As expected, given analysis of the eigen values and scree plot, the six-factor solution, which explained 51% of the variance, provided the simplest interpretable structure of factor groupings. One item, “*Over the past week, I’ve been able to get enough sleep at night to feel fully alert and well-rested during the day*” did not have a loading of above .30 on any factor and was thus removed. Analysis was repeated with the remaining 21 items. The six factors in this final model, summarised in Table 3, explained 53% of the variance in the data.

The internal consistency for each of the six scales was moderate to strong, apart from Living Conditions, see Table 3. Composite scores were created for each of the six factors. Distribution was normal for the factors except for Supervisory Relationship, where a positive skew was observed, though the level of skew (-.99) and kurtosis (.29) remained within an acceptable range. There were substantive correlations between the factors, ranging from $r = .49$ for the correlation between academic support network and supervisory relationship to $r = .07$ for the relationship between supervisory relationship and financial confidence.

Regression Analysis

Multiple regression analysis was used to assess how contextual and individual factors were associated with perceived stress and separately, mental wellbeing, while controlling for sociodemographic characteristics and subject of study. Assumptions for multiple

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3 linear regression were partially met² with funnelling, indicative of mild heteroscedasticity
4 observed in the model predicting mental wellbeing. A bootstrapping approach to
5 regression analysis, including 1000 samples, was thus adopted. For each dependent
6 variable, four models were run, adding blocks of factors successively (demographics,
7 subject of study, contextual factors and individual factors). Each model accounted for a
8 significant increase in the proportion of the variance in the data explained. Table 4 reports
9 the coefficients for the full models.
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20 Levels of perceived stress were lower among men. Family support, sleep and
21 better overall health were linked to lower stress and better mental wellbeing. Support
22 from supervisors and feeling confidently prepared were linked to lower stress, though did
23 not predict mental wellbeing. Individuals with an achievement orientation and those
24 feeling more confident about their future career reported better mental wellbeing. Self-
25 depreciation (imposter phenomenon) predicted stress and lower mental wellbeing.
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34 *Self-Depreciation*

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40 ² Our plot of standardised residuals vs. standardised predicted values showed no obvious signs of
41 funnelling for the model predicting perceived stress, suggesting the assumption of homoscedasticity has
42 been met. Analysis of scatter plots indicated that, broadly, the assumption of linearity was met for both
43 models. Analysis of collinearity statistics showed no indicated of multicollinearity, as VIF scores were well
44 below 10 (highest score = 3.05) and tolerance scores above 0.2 (lowest score = .36). Indicating
45 independence of residuals, the Durbin-Watson statistic for both full models fell within the limits of
46 acceptability (predicting perceived stress Durbin-Watson = 1.94; predicting mental wellbeing Durbin-
47 Watson = 1.97). The P-P plot for both models suggested that the values of the residuals were normally
48 distributed. Cook's Distance values were all under 1, suggesting individual cases were not unduly
49 influencing either model.
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3 Self-depreciation was significantly related to both mental wellbeing and perceived stress.
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5 As contextual factors relating to the doctoral experience may influence self-depreciation,
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7 providing a pathway to reduce stress and improve mental wellbeing, we ran further post-
8
9 hoc analysis to understand more about the role of self-depreciation. Self-depreciation
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11 correlated with five of our six doctoral experience scales; lower levels of self-depreciation
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13 are seen in individuals who feel their living conditions are good ($r = -0.17, p = .001$), have
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15 a stronger academic support network ($r = -.24, p < .001$), feel confidently prepared ($r = -$
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17 $.41, p < .001$) and are more confident about their finances ($r = -.25, p < .001$) and future
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19 career ($r = -.32, p < .001$). The relationship between self-depreciation and supervisor
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21 support was only marginally significant, $r = -.10, p = .044$.
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27 **Discussion**

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29 We surveyed doctoral researchers to identify how aspects of their experience, in
30
31 combination, impacted on mental wellbeing and perceived stress. Through factor analysis
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33 items relating to the doctoral experience were clustered into 6 groups; academic support
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35 network, financial confidence, living conditions, career confidence, supervisory
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37 relationship and confidently prepared. Multiple regression analysis indicated that some
38
39 of these themes predicted mental wellbeing and stress: good supervisory support and
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41 feeling confidently prepared predicted lower levels of stress; career confidence predicted
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43 better mental wellbeing; family support, self-depreciation, achievement orientation,
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45 overall health and hours of sleep, predicted stress and mental wellbeing.
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51 Contrary to the narrative that undertaking a PhD is extremely challenging (e.g.,
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53 Metcalfe et al., 2018) we found many positive experiences. Respondents tended to give
54
55 positive ratings for their supervisory relationship and reported feeling confidently
56
57 prepared. Positivity regarding the supervisory relationship reflects observations in the UK
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3 Postgraduate Research Experience Survey (Advance HE, 2017) and Berkeley Report
4 (Panger et al., 2014). Highlighting positive experiences is important (Guthrie et al., 2017)
5
6 and challenges cultural narratives, that successfully completing doctoral research
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8 inevitably involves sacrificing well-being.
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13 While positives were identified, concerns remain. Mental wellbeing was low, with
14
15 a quarter of respondents reporting levels of mental wellbeing that indicate probable
16
17 anxiety or depression. The average mental wellbeing score (20.22) was notably lower
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19 than the 23.68 reported in age-matched normative data (Fat et al., 2016). **While this**
20
21 **difference may reflect sampling biases (i.e., oversampling PhD students concerned about**
22
23 **mental wellbeing), the difference echoes findings from studies in Belgium and the USA**
24
25 (Levecque et al., 2017; Evans et al., 2018) and supports the call for more attention to be
26
27 directed towards the mental wellbeing of this population (e.g., Metcalfe et al., 2018).
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32 Respondents' career confidence was low, and this significantly predicted stress.
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34 Fewer than two in five respondents reported feeling confident about their career or having
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36 a good idea of the career directions they could pursue. Steps taken to explore career
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38 options and build confidence around future career may be beneficial for reducing stress
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40 in doctoral researchers.
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44 Addressing self-depreciation (imposter phenomenon), may be another root to
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46 improving mental wellbeing. Self-depreciation predicted higher levels of stress and lower
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48 levels of mental wellbeing. Looking at the items in the self-depreciation scale, nearly two-
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50 thirds (63%) of respondents reported often feeling they were 'in over their heads' and
51
52 three-quarters often worry about failing. There was a strong negative correlation between
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54 self-depreciation and confidence in preparation for research. The importance of perceived
55
56 personal competence has been highlighted previously. For example, a lack of confidence
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3 ability to conduct research and feeling disappointed in one's abilities are important
4 stressors among doctoral researchers (Hargreaves et al., 2014) and those who exhibit self-
5 critical perfectionism have lower levels of wellbeing (Flaxman et al. 2012; Mark & Smith,
6 2012).
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13 Recommendations for tackling self-depreciation include enhancing workplace
14 social support, clarifying expectations and setting appropriate work-related boundaries
15 (Parkman, 2016). These ideas are captured within the cluster of items around Academic
16 Support Network, an area of the doctoral experience where there is room for
17 improvement. Strikingly only just over half of respondents (54%) felt that their role
18 within the wider academic community was clear. Steps to clarify the doctoral researchers'
19 role and support them to feel included and confident reaching out to other academics may
20 help tackle self-depreciation.
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32 Achievement orientation strongly predicted mental wellbeing. Orientation
33 towards goals of self-improvement and growth have been associated with adaptive socio-
34 emotional functioning and mental wellbeing (e.g., Dykman, 1998; Daniels et al., 2008).
35 This scale includes items such as "I often accomplish a lot of work," "I often excel in
36 what I do," "I often do a lot in my spare time," tapping into motivation and self-efficacy.
37 Improvements in self-efficacy should improve mental wellbeing and reduce stress
38 (Grotan, Sund & Bjerkeset, 2019; Burger & Samuel, 2017). Scaffolding the learning
39 experience to provide experience performance accomplishments and build a sense of
40 mastery will contribute to self-efficacy (Bandura, 1977; Bandura, 2006). While doctoral
41 studies push students to develop new skills and knowledge, the pace of change is
42 important; doctoral researchers will benefit from being able to work at their own level, so
43 that goals are within reach (Vygotsky, 1978).
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3 Sleep and overall health were strongly related to stress and mental wellbeing.
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5 While there may be benefits in encouraging students to take time to look after their
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7 physical health and develop good habits around sleep, it is important to recognise that the
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9 causal direction in this study is unclear. Sleep and overall health are commonly negatively
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11 impacted by stress and poor mental wellbeing.
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16 There are several important limitations to this study. The study used a
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18 convenience sample, introducing opportunity for bias. While we can draw conclusions
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20 about the relationship between factors, controlling for socio-demographic variables, it is
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22 important not to generalise prevalence statistics from this data set. The data here is cross-
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24 sectional, limiting our ability to draw conclusions about the direction of relationships. For
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26 instance, while the model presented here suggests that perceived stress and mental
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28 wellbeing can be predicted, in part, by self-depreciation, it may be that the relationship is
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30 reversed, with self-depreciation being determined by stress and mental wellbeing.
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32 Longitudinal research studies will be necessary to better understand the directionality of
33
34 the relationships between variables.
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40 To summarise, as expected from studies of the general population, stress and
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42 mental wellbeing among doctoral researchers are influenced by **factors including health,**
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44 **sleep and social support.** Our data indicate that students broadly feel well supported by
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46 their supervisors, but respondents do not identify the same support from the department
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48 and faculty. Additional efforts to help doctoral researchers feel included and valued could
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50 occur at the department and faculty level. Career confidence is low and addressing this
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52 may be important for mental wellbeing. Achievement orientation and self-depreciation
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54 are of central importance. Efforts to boost the confidence of doctoral researchers and
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56 provide more rigorous academic scaffolding to reduce the fear of failure and build self-
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58 efficacy, may have a substantive positive impact on mental wellbeing.
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3 **Data availability statement**
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6 The data supporting the findings of this study are available from the corresponding
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8 author upon reasonable request.
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Table 1. Participant demographics

Variable	Total sample (<i>N</i> = 431)
Age ranges, years (21-25 / 26-30 / over 30)	145 / 144 / 141
Gender (Male / Female)	130 / 273
Sexuality (Heterosexual/Minority Sexuality*)	332 / 93
Ethnicity (White British/Other White/BAME [†])	226 / 109 / 96
Student status (Home/EU/International)	262 / 79 / 88
Research area ¹	
Arts & Humanities	94
Medicine, Dentistry and Allied Healthcare	83
Psychiatry, psychology and neuroscience	71
Science, Technology, Engineering, Maths	121
Social Sciences ¹	59

*Including, Bisexual (*N* = 35), Pansexual (*N* = 13), Gay (*N* = 8), Lesbian (*N* = 11), Queer (*N* = 5), Asexual (*N* = 5), Questioning (*N* = 4) and Non-conforming (*N* = 7).

[†]Including, Asian or Asian British (*N* = 28), Black or Black British (*N* = 6), Chinese or Chinese British (*N* = 19), Mixed ethnicity (*N* = 18), Other ethnic group (*N* = 21).

¹Including Geography, International affairs, Business and management, Politics, and Economics.

Table 2: Single survey items and proportion of respondents agreeing with statement

	(%)
Personal and contextual resources for academic work	
<i>Supervisor as Asset</i> : My supervisor is an asset to my academic and professional career	82
<i>Progress</i> : I am on track to complete my degree program on time	79
<i>Preparation</i> : I am well-prepared for the work required to complete my program	79
<i>Task Clarity</i> : In regard to my PhD, I understand what I'm supposed to be doing	75
<i>Supervisor as Mentor</i> : My supervisor is a real mentor to me	68
<i>Network</i> : I have a good academic support network	66
<i>Groups</i> : I regularly attend research group meetings	60
<i>Respected</i> : I feel like my culture is valued and respected by my peers, the administration and the faculty in my department	58
<i>Included</i> : I feel valued and included by my peers, the administration and the faculty in my department	57
<i>Collaboration</i> : I feel confident reaching out to other academics working in my area to share research findings, seek advice and consider collaborative work	56
<i>Role Clarity</i> : My role as a PhD student within the wider academic community is clear	54
<i>Engagement</i> : I am not very engaged by my day-to-day work (reversed)	47
<i>Hassles</i> : My department reduces hassles and paperwork to a minimum and frees me to focus on what's important.	47
<i>Resources</i> : I have the space and the resources I need in the university to succeed academically	27
Living conditions and financial security	
<i>Safety – Home</i> : Where I live, I feel safe	93
<i>Safety – Campus</i> : On campus, I feel safe	93
<i>Financial Position</i> : I can get by financially without having to cut back on too many of the things that are important to me	60
<i>Sleep</i> : Over the past week, I've been able to get enough sleep at night to feel fully alert and well-rested during the day	54
<i>Financial Concerns</i> : I've been concerned about money lately	54
<i>Financial Confidence</i> : I'm confident about my financial situation	49
<i>Living Conditions</i> : Where I live, I'm satisfied with my living conditions	41
Career Confidence	
<i>Career Plan</i> : I have a plan for what I'm going to do when my PhD is complete	48
<i>Career Directions</i> : I have a good idea of the range of career directions that I could take following my PhD	38
<i>Career Confidence</i> : I feel confident about my career after the PhD	38
All items used a 7-point Likert scale on which participants were asked to indicate their agreement (strongly disagree – strongly agree).	

Table 3: Factor coefficients for linear combination of variables following oblimin rotation

	Academic support network	Financial confidence	Living conditions	Career confidence	Supervisory relationship	Confidently prepared
Cronbach's alpha	.82	.73	.61	.81	.88	.70
Included	.72					
Collaboration	.67					
Network	.67					
Respected	.62					
Groups	.54					
Role Clarity	.48					
Hassles	.38					
Financial position		.86				
Financial concerns		.80				
Financial confidence		.45				
Living conditions			.76			
Safety - home			.69			
Safety - campus			.48			
Career plan				.85		
Career directions				.72		
Career confidence				.67		
Supervisor as asset					.93	
Supervisor as mentor					.84	
Preparation						.84
Progress						.62
Task clarity						.33

Table 4: Coefficients for regression models

	Perceived Stress Scale			SWEMWBS		
	b	95% CI	Sign	b	95% CI	Sign
Constant	15.82	12.10, 19.30	***	8.66	4.11, 12.72	***
Demographics						
Male	-.90	-1.41, -.38	**	.40	-.24, 1.09	ns
Home ¹	.26	-.52, 1.07	ns	.50	-.46, 1.47	ns
White British	-.30	-1.07, .49	ns	-.03	-1.02, .87	ns
Non-heterosexual	.56	-.001, 1.17	ns	-.48	-1.16, .23	ns
Age	.01	-.30, .35	ns	-.03	-.46, .38	ns
Subject of Study						
STEM (ref)	-		-	-		-
Arts and Humanities	.48	-.34, 1.19	ns	-.29	-1.32, .68	ns
Social Sciences	-.32	-1.09, .51	ns	.74	-.21, 1.77	ns
Medicine and Allied Health Care	.37	-.34, 1.07	ns	-.43	-1.17, .38	ns
PPN	-.43	-1.14, .30	ns	.89	-.02, 1.75	ns
Contextual Factors						
Space and Resources	.01	-.18, .17	ns	-.001	-.19, .21	ns
Supervisor Support	-.11	-.20, -.02	*	.05	-.06, .16	ns
Academic Support Network	.01	-.03, .05	ns	.03	-.02, .08	ns
Career Confidence	-.05	-.11, .02	ns	.13	.05, .21	**
Living conditions	.00	-.09, .08	ns	.06	-.05, .15	ns
Financial Confidence	-.00	-.05, .05	ns	.03	-.03, .10	ns
MSPSS: Sig Other	.01	-.03, .05	ns	.05	-.00, .10	ns
MSPSS: Family	-.06	-.12, -.01	*	.07	.01, .14	*
MSPSS: Friends	-.06	-.14, .03	ns	.07	-.03, .16	ns
Individual Factors						
Confidently Prepared	-.10	-.18, -.003	*	.03	-.09, .14	ns
Self-Depreciation	.10	.06, .14	***	-.06	-.12, .00	*
Achievement	-.02	-.05, .01	ns	.07	.04, .11	***
Orientation Scale						
Days of Physical Activity	.08	-.37, .55	ns	.12	-.48, .69	ns
Hours of Sleep	-.37	-.57, -.17	***	.33	.11, .58	*
General Health	.85	.54, 1.13	***	-.70	-1.03, -.39	***

(1) Home students, as compared to international or EU students. Perceived stress, $R^2 = .53$, $F(24, 357) = 16.57$, $p < .001$; Mental Wellbeing, $R^2 = .51$, $F(24, 357) = 15.53$, $p < .001$. * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.