Students' perceived stress and perception of barriers to effective study: impact on academic performance in examinations

IN BRIEF
- Explores students' perceptions of factors affecting their ability to study effectively
- Reports on levels of perceived stress in students
- Identifies factors predicting perceived stress
- Identifies factors predicting examination performance

J. Turner,*[1] D. Bartlett,[2] M. Andiappan[3] and L. Cabot[4]

VERIFIABLE CPD PAPER

Aims To identify students' perceptions of barriers to effective study and the relationship between these and demographic characteristics, levels of perceived stress and examination performance. **Materials and Methods** A questionnaire was distributed to first (BDS1) and final year (BDS5) King's College London dental undergraduates, during Spring 2013. Data were collected on students' social and working environment using a Likert scale from zero to four. Levels of perceived stress and end-of-year examination results were collected. Statistical analyses were undertaken using SPSS® and Stata® software. **Results** A response rate of 83.0% (BDS1) and 82.9% (BDS5) was achieved. Social distractions were perceived to hinder study, with median scores of two and three for females and males respectively. The mean perceived stress score differed significantly (p = 0.001) between males and females. Difficulties with journey was a significant predictor of perceived stress (p = 0.03) as were family responsibilities (p = 0.02). Social distractions were significantly related to examination performance (p = 0.001). **Conclusions** Social distractions were the barrier most highly rated as hindering effective study. Levels of perceived stress were high and were significantly associated with gender, a difficult journey to university and family responsibilities. Social distractions were significantly related to examination performance; students rating social distractions highly, performed less well.

INTRODUCTION

Undertaking a dental degree in the United Kingdom involves a lengthy and expensive Bachelor of Dental Surgery (BDS) programme. The majority of individuals enter their first year (BDS1) directly after A levels and graduate five years later, at the end of BDS5. A number of factors have been suggested in the literature as having the potential to affect students' progression through training, leading to reduced performance in assessments and potentially the termination of their studentship. The factors cited include stress, debt, gender and age. Data from the intake of medical students over a three-year period, showed prior possession of another degree resulted in a 2.4% reduction in students leaving the course.[1] Wilkinson et al.,[2] in a questionnaire-based survey from 587 medical students, observed that improved assertiveness and motivation were associated

with possession of a prior degree and this was attributed to the students being older. Yates and James[3] undertook a longitudinal retrospective study of the progress of medical students, over three consecutive years of intake, but they reported no significant association to age at admission.

The link between gender and performance has also shown conflicting results. Two studies reported that being female was a good predictor of future successful medical school performance[3,4] and similarly two studies observed female dental students outperformed their male peers.[5,6] In contrast, Sanders and Lushington[7] reported gender did not predict academic performance for 202 Australian dental students and Stewart et al.[8] observed no gender differences in their retrospective analysis of 416 American dental students. Fields' study on American dental schools, observed male students significantly out-performed females in the Part II National Board Dental Examination.[9]

The relationship between stress and academic performance in dental students has produced conflicting results, with Elani et al.'s[10] systematic review of the literature identifying ten studies showing a relationship and two that did not. Elani et al.'s review[10] established that very high levels of stress were experienced by students, mainly

as a result of academic and clinical factors. Alzahem et al.'s systematic review[11] of the literature established that the five most commonly occurring stressors were: accommodation issues; personal factors; educational environment; academic issues; and clinical issues. Factors related to student accommodation may impact on performance, including the time spent travelling from home to college, the nature of the accommodation and related social factors. One study reported that students living off-campus, were potentially less able to socially integrate with their peers and found a higher proportion of such students dropped out of medical school,[1] and for Canadian dental students living with parents, higher stress scores were observed than those living elsewhere.[12] Students use a range of methods to maintain social ties with friends and family, and in particular social media and instant messaging (IM).[13] Quan-Haase[14] observed 67% of Canadian undergraduates in her research, used IM daily and 29% on a weekly basis, with 28% reporting over three hours use every day. A relationship between increased use of social networking sites has been shown to decrease academic performance[15] and the use of IM at the same time as studying has been shown to reduce efficiency.[16] With the changing funding to UK higher education, personal debt might also

[1,2,4]Kings College London Dental Institute, Guys Tower, London Bridge, SE1 9RT, [3]Biostatistics and Research Methods Centre, King's College London, Dental Extension Building, Denmark Hill, London, SE5 9RJ
*Correspondence to: Jonathan Turner
Email: jonathan.turner@kcl.ac.uk

be expected to influence progression.[1,17] The British Dental Association conducted a survey in 2013 of final year UK dental undergraduates, and observed the average total debt of the 106 respondents to be £24,734.[18] They predicted the total debt for a graduate, from an English dental school, is likely to exceed £60,000 by 2018/19.

King's College London Dental Institute (KCLDI) is the largest dental school in the United Kingdom with 151 dental students graduating in 2013. In addition to its five-year undergraduate pathway, KCLDI also offers a four-year entry route for graduates (GPEP). The final three years of these two routes (BDS3, BDS4 and BDS5) are identical.

The aims of this research were to:

1. Identify students' perceptions of barriers to effective study, and the relationship between barriers and demographic characteristics
2. Determine the level of perceived stress among dental students, and the relationship between perceived stress and demographic characteristics
3. Explore the relationship between demographic characteristics, perceived barriers to effective study and perceived stress
4. Explore the relationship between demographic characteristics, perceived barriers to effective study, perceived stress and performance in examinations.

METHOD

Design, setting and sample

A previously piloted questionnaire was distributed to BDS1 and BDS5 students attending KCLDI. In addition to basic demographic information, the questionnaire assessed students' opinions on accommodation and debt. Accommodation related questions included journey difficulty, family responsibilities, lack of resources, lack of space to work, noise and social distractions. Students scored questions using Likert scales[19] ranging from zero to four with four indicating 'a significant hindrance to study'. Students were asked their levels of debt both with and without tuition fees and used a Likert scale to score the extent to which they perceived worry about their debt affected studies. A 10-item Perceived Stress Scale (PSS), previously validated[20] and used in previous investigations on dental students, was also included. Cronbach's alpha in the current sample was 0.87.

Data collection

Following ethical approval from King's College London (reference BDM/11/12-117), the BDS1 and BDS5 students were invited to participate in the study and were given a verbal explanation about the nature of this research. An envelope containing the questionnaire and an information sheet was then given to each eligible student during one of their classes in January and February 2013. One further, final invitation to participate was also made approximately two weeks later. Data from the completed questionnaires were then processed, with the PSS score being calculated for each individual, following the standard protocol.[20] The end of year BDS1 examination was comprised of a written and online paper. The examination results were collected and an average percentage score calculated for each student. Similarly, the BDS5 examination was comprised of five components; the results were collected and an average score calculated for each student. Data were analysed to determine whether questionnaire results were predictive of end of year examination results.

Statistical analysis

The data analyses were carried out using SPSS® (Version 20, IBM®, Armonk, New York) and Stata® (Version 12, StataCorp LP, Texas). Descriptive statistics were used to summarise the demographic and other quantitative variables. Percentages were used to summarise the students in each groups for various measures. The comparison of PSS scores between BDS1 and BDS5 was carried out using the independent samples t-test and the Mann Whitney test was used to compare other measures between these two groups, as the data did not conform to the assumption of a normal distribution. Similarly, the comparison between males and females was carried out using the Mann Whitney test for the 'social distractions' and 'worry about debt' questions and the independent samples t-test used for the PSS scores. The age groups and the end of year marks were compared for various measures using Kruskal Wallis, one way ANOVA and parametric one way ANOVA for PSS scores. Logistic regression was used to determine the significant predictors of end-of-year examination results and of PSS scores.

For all analyses, other than the logistic regressions, a significance level of 0.01 was adopted in order to reduce the possibility of Type I errors arising from the multiple comparisons. For the two logistic regressions an alpha of 0.05 was adopted.

RESULTS

A total of 129 BDS1 and 146 BDS5 students were eligible to complete the questionnaire and from these 107 students in BDS1 (83%) and 121 from BDS5 (82.9%) completed the study. The demographic characteristics of the sample are summarised in Table 1. The majority of respondents were female (59.7%), with 21.5% of students already having obtained a degree and 20.5% of BDS5 students on the Graduate Entry Route (GPEPs).

University halls of residence were the accommodation type for 43.0% of BDS1 students, but this figure reduced to 1.7% for BDS5 students. For BDS1, 11.2% lived in a student flat / house share, compared to 51.7% in BDS5. There was no significant difference ($p = 0.39$) between gender and accommodation, with 40.7% of female students living in the parental home, compared to 31.5% of males and 28.9% of females living in a student flat/house share, compared to 38.0% of males.

Examination results for all 107 BDS1 questionnaire respondents, were a mean score of 65.9%, and an upper quartile ranging from 77.0% to 87.5% and lower quartile from 19.0% to 58.0%. Examination results for 120 BDS5 questionnaire respondents, were a mean score of 61.5%, an upper quartile ranging from 63.2% to 74.2% and a lower quartile from 53.4% to 58.8%.

The questions related to the accommodation factors, which students perceived to hinder their study, observed both BDS1 and BDS5 students scored social distractions highest. There was no statistically significant difference ($p = 0.36$) between the BDS1 and BDS5 scores (Table 2). The comparison between different age groups observed a significant difference between age bands with respect to the difficulty with journey ($p = 0.01$) with the over 25 years age group having the highest median score (Table 2).

The levels of debt, excluding tuition fees, differed significantly ($p < 0.001$) between year groups, with 94.2% of BDS1 students having debts of less than £10,000, compared to 43.5% of BDS5 students who had debts of £20,000 and over (Table 1). When asked whether worrying about debt affected their studies, the scores were low for both genders and year groups. There was a significant difference ($p < 0.0001$) between age bands (Table 2) with respect to worrying about debt scores.

The BDS5 students had a statistically significantly higher ($p = 0.004$) mean PSS score than BDS1 students and females had significantly higher ($p = 0.001$) mean PSS scores than males (Table 2). The PSS scores differed significantly ($p = 0.005$) between different age groups (Table 2) - post-hoc analysis revealed that the 20-24 age band had higher PSS mean score when compared to the under 20 group ($p < 0.05$). The regression analysis of PSS results and different variables observed gender to be a significant predictor ($p < 0.0001$) with females experiencing more perceived stress than males,

Table 1 Demographic characteristics of BDS1 and BDS5 respondents		
	BDS1 N (%)	BDS5 N (%)
GENDER		
Male	46 (43.0)	46 (38.0)
Female	61 (57.0)	75 (62.0)
TOTAL N (%)	107 (100.0)	121 (100.0)
AGE		
Under 20	75 (70.1)	-
20 to 24	29 (27.1)	93 (76.9)
25 or over	3 (2.8)	28 (23.1)
TOTAL N (%)	107 (100.0)	121 (100.0)
PREVIOUS DEGREE		
No	92 (86.0)	87 (71.9)
Yes	15 (14.0)	34 (28.1)
TOTAL N (%)	107 (100.0)	121 (100.0)
ACCOMMODATION		
Parental home	43 (40.2)	41 (34.2)
Own home*	3 (2.8)	9 (7.5)
Student flat/house share	12 (11.2)	62 (51.7)
University hall of residence	46 (43.0)	2 (1.7)
Other*	3 (2.8)	6 (5.0)
TOTAL N (%)	107 (100.0)	120 (100.0)
LEVEL OF DEBT (excluding tuition fees)		
0	44 (42.3)	20 (17.4)
<£10,000	54 (51.9)	21 (18.3)
£10,000–£19,999	5 (4.8)	24 (20.9)
£20,000 and over	1 (1.0)	50 (43.5)
TOTAL N (%)	104 (100.0)	115 (100.0)
EXAM RESULTS		
Mean	65.9%	61.5%
Upper quartile	77.0% - 87.5%	63.2% - 74.2%
Lower quartile	19.0% - 58.0%	53.4% - 58.8%
Number of students	107	120
*Combined for regression analysis		

by a factor of 3.8 (Table 3). Students that reported greater difficulties with their journey to university experienced significantly higher levels of perceived stress (p = 0.03) as did those reporting greater family responsibilities (p = 0.02).

The regression analysis of BDS1 and BDS5 end-of-year marks, observed social distractions to be the only significant predictor (p <0.001) of performance in the examinations (Table 4). The greater the extent to which students felt that social distractions

hindered their ability to study effectively, the worse they performed in their examinations.

DISCUSSION

The rationale for selecting BDS1 students for this research was that the majority of students that failed to progress and left the BDS programme, did so at the end of BDS1. Identifying factors that have the potential to affect progression was clearly relevant to this group. The BDS5 students were selected, as these individuals were at the end of their

academic studies and in a position to reflect on their education and the relationship to debt. The use of questionnaires proved to be an effective method to collect data, achieving a good completion rate of 83.0% for BDS1 and 82.9% for BDS5 and this can be considered to be representative.

A significant number of students in our study lived off campus, with 40.2% of BDS1 and 34.2% of BDS5 living in their parental home. Previous work showed a relationship between students' accommodation arrangements and progression, with those living off-campus having a higher dropout rate than those living on-campus[1] hence the rationale for asking students whether they perceived a range of factors, related to accommodation, hindered their ability to study effectively.

The journey to university was not perceived by students to be a hindrance, despite the large number living off-campus. Similarly family responsibilities were not perceived to be a hindrance despite the large number of students living in their parental home. The significant difference in scores observed between age groups for the 'difficulty with the journey to University' question may be explained by the location of their accommodation. University Halls of Residence were the accommodation type for 49.3% of under 20-year-olds, whereas 41.9% of the over 24-year-olds lived in shared student houses, the location of the former tending to be nearer to university than the latter. London has good transport links but high accommodation and living costs. The unique infra-structure of London makes comparisons of accommodation factors with students from other dental schools in the UK difficult. The only accommodation factor that was rated highly as a hindrance to study was 'social distractions'. The exact nature of these distractions is unclear, though it is feasible that some of these distractions could be related to use of social media, as described above.

UK dental students accrue high levels of debt during their training; they are required to pay tuition fees, which were £3,145 for those KCLDI students starting in 2008 (the BDS5 five year pathway students surveyed in this research) and £9,000 for those starting in 2012 (the BDS1 students). In addition, the majority of King's College students live in London, which results in high maintenance costs. The BDS5 students in our research had significantly higher debts than BDS1 students, due to the accumulation of debt over a greater time period, and even when tuition fees were excluded, the BDS5 students' levels of debt were greater than £20,000 for 43.5%. Despite this level of debt the students did not seem to be particularly concerned or stressed over the level of debt. Ross *et al.*[21] observed

Table 2 Perceived barriers to study								
	PERCEIVED BARRIERS TO STUDY							PSS SCORE
	0 = No hindrance to studies, 4 = Significant hindrance to studies							
	Difficulties with journey	Family responsibilities	Lack of resources	Lack of space to work	Noise	Social distractions	Worry about debt	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
	Median (min, max)	Median (min, max)	Median (min, max)	Median (min, max)	Median (min, max)	Median (min, max)	Median (min, max)	Median (min, max)
Gender								
Female	1.53 (1.40)	1.11 (1.36)	0.65 (1.14)	1.02 (1.38)	1.62 (1.37)	2.19 (1.30)	1.19 (1.31)	20.23 (6.59)
	1.50 (0, 4)	0.50 (0, 4)	0.00 (0, 4)	0.00 (0, 4)	1.00 (0, 4)	2.00 (0, 4)	1.00 (0, 4)	20.00 (7, 38)
Male	1.34 (1.30)	0.96 (1.29)	0.61 (1.04)	1.04 (1.21)	1.65 (1.29)	2.49 (1.25)	1.20 (1.35)	16.92 (7.31)
	1.00 (0, 4)	0.00 (0, 4)	0.00 (0, 4)	1.00 (0, 4)	2.00 (0, 4)	3.00 (0, 4)	1.00 (0, 4)	17.00 (1, 36)
p value	0.36	0.38	0.92	0.47	0.80	0.09	0.86	0.001
Age								
<20	1.11 (1.30)	0.84 (1.20)	0.54 (0.96)	0.79 (1.11)	1.64 (1.24)	2.27 (1.41)	0.68 (1.04)	16.74 (5.97)
	0.00 (0, 4)	0.00 (0, 4)	0.00 (0, 3)	0.00 (0, 4)	2.00 (0, 4)	3.00 (0, 4)	0.00 (0, 4)	16.50 (5, 32)
20–24	1.57 (1.37)	1.11 (1.33)	0.67 (1.20)	1.05 (1.35)	1.60 (1.39)	2.33 (1.22)	1.37 (1.33)	20.09 (7.43)
	1.00 (0, 4)	1.00 (0, 4)	0.00 (0, 4)	0.00 (0, 4)	1.00 (0, 4)	2.00 (0, 4)	1.00 (0, 4)	20.00 (1, 38)
25+	1.81 (1.33)	1.33 (1.59)	0.71 (1.01)	1.53 (1.48)	1.74 (1.37)	2.37 (1.27)	1.78 (1.53)	19.47 (7.04)
	2.00 (0, 4)	0.00 (0, 4)	0.00 (0, 3)	1.50 (0, 4)	2.00 (0, 4)	3.00 (0, 4)	2.00 (0, 4)	18.50 (7, 33)
p value	0.01	0.29	0.65	0.06	0.82	0.97	<0.0001	0.005
Year of Study								
BDS1	1.30 (1.39)	0.90 (1.23)	0.53 (0.97)	0.81 (1.15)	1.68 (1.27)	2.22 (1.34)	1.02 (1.28)	17.48 (6.17)
	1.00 (0, 4)	0.00 (0, 4)	0.00 (0, 4)	0.00 (0, 4)	2.00 (0, 4)	2.00 (0, 4)	1.00 (0, 4)	17.00 (5, 33)
BDS5	1.59 (1.32)	1.18 (1.41)	0.72 (1.20)	1.22 (1.42)	1.60 (1.39)	2.40 (1.23)	1.35 (1.35)	20.16 (7.58)
	1.00 (0, 4)	1.00 (0, 4)	0.00 (0, 4)	1.00 (0, 4)	1.00 (0, 4)	3.00 (0, 4)	1.00 (0, 4)	20.00 (1, 38)
p value	0.07	0.14	0.28	0.03	0.55	0.36	0.05	0.004

no relationship between debt levels and performance, in medical students, however students who worried about money underperformed in their degree examinations. The results of our regression analysis contradicted this finding as worry about debt did not significantly predict performance in end-of-year examinations. While it is difficult to understand precisely the reasons for this result, it may reflect the growing realisation among University students that debt is a universal experience and inevitable. Harrison et al.'s[22] interview-based study of 62 UK undergraduates, found they generally accepted debt as being a normal aspect of student life with repayment being a future worry.

The Cronbach's alpha value of 0.87 indicated that the questionnaire was a reliable measure of students' levels of perceived stress. There were significant differences between the mean PSS scores for a number of the analyses. The mean scores for females and males were both notably higher than the norm values for the general population of the United States of 16.1 (±7.6) and 15.5 (±7.4) respectively.[23] It is worth noting that our questionnaire was deliberately distributed in February and that if it had been administered nearer the examination period for example, the PSS values would probably have been higher still. Students at different stages of their undergraduate training have been shown to have different levels of stress, with Alzahem et al.[24] observing year three Saudi Arabian dental undergraduates having the greatest stress and year one the lowest. The BDS5 students in our research had significantly higher PSS scores than BDS1 students, which was unsurprising as the BDS5 students were nearing their final examinations and had clinical quotas and deadlines to meet beforehand, unlike the BDS1 students who were predominantly assessed at the end of their course.

Our research found no relationship between perceived stress and examination performance, which was in agreement with Sanders and Lushington's study on Australian dental students, which established little evidence for an association between performance and stress.[7] Cohen and Williamson[20] explain that after four to eight weeks the predictive validity of the PSS is expected to decline; as the questionnaire was distributed in January and February and the BDS5 and BDS1 examinations started in April and May respectively, a strong correlation would not be expected. It would be interesting to repeat the PSS questions closer to the examination period, to establish whether a correlation is found.

Female students had significantly higher PSS scores than male, a result which supports the findings of other work[11,25,26] with

Table 3 Regression analysis of Perceived Stress Scale and different variables

Predictors	Reference	Coef	p value	95% Confidence intervals	
				LCL	UCL
Male	Female	-3.84	<0.0001	-5.82	-1.87
BDS5	BDS1	0.69	0.69	-2.77	4.16
Age	<20				
20–24		1.30	0.42	-1.85	4.46
25 and over		-1.73	0.46	-6.34	2.89
Debt (excluding tuition fees)	No Debt				
<£10,000		-1.46	0.27	-4.04	1.13
£10,000–£19,999		0.74	0.71	-3.19	4.67
>=£20,000		-0.84	0.65	-4.55	2.86
Accommodation	Parental home				
Flat share		1.21	0.45	-1.93	4.34
University halls		1.08	0.53	-2.34	4.49
Own/other		2.47	0.23	-1.54	6.48
Journey difficulty		1.09	0.03	0.11	2.06
Family responsibilities		0.95	0.02	0.14	1.77
Lack of resources		0.57	0.35	-0.63	1.77
Lack of space		-0.03	0.95	-0.98	0.92
Noise		0.49	0.29	-0.42	1.41
Social distractions		0.65	0.12	-0.18	1.48
Worry about debt		0.29	0.50	-0.56	1.14

Table 4 Regression analysis of BDS1/BDS5 end-of-year marks and different variables

Predictors	Reference	Coef	p value	95% Confidence intervals	
				LCL	UCL
Male	Female	-0.68	0.68	-3.96	2.60
Perceived Stress Scale		-0.13	0.30	-0.38	0.12
Journey difficulties		-1.08	0.09	-2.32	0.17
Family responsibilities		-0.07	0.92	-1.38	1.25
Lack of resource		0.63	0.51	-1.23	2.48
Lack of space		0.61	0.42	-0.87	2.09
Noise		-0.65	0.37	-2.08	0.78
Social distractions		-2.27	0.001	-3.59	-0.95
Debt worries		0.43	0.48	-0.78	1.65

Pau and Croucher[27] suggesting that females may be more likely to admit to experiencing stress than males. Elani et al.[10] noted that high stress levels impact adversely on individuals' physical and mental health. The management of dental student stress is thus of great importance and all students in our work, with a high PSS score, were given information of counselling services offered by King's College, London and advised to consider speaking to their personal tutor. Alzahem et al.[28] observed much variation in the stress management programmes offered by different dental institutions and

highlighted the importance of continued work in the field of stress management.

Our results did not find accommodation type to be a significant predictor of PSS scores, however, both difficulties with 'journey to university' and 'increased family responsibilities' were. A large proportion of the students (40.2% of BDS1 and 34.2% of BDS5) lived in the parental home, with many of these homes being situated on the outskirts of London, necessitating a lengthy commute. The high cost of living in Central London, or cultural factors, are possible explanations for students choosing to live with parents and some of these individuals may have had additional family responsibilities as a result. Gambetta-Tessini et al.[29] found social support to be negatively associated with stress and it is possible that those students with journey difficulties and family responsibilities also receive less social support from peers, thus increasing stress further.

The regression analysis of end-of-year examination results observed social distractions to be the only significant predictor of those analysed. It is unsurprising that students who felt social distractions were hindering their studies performed less well, though as discussed above, the exact nature of these distractions is unclear. Interviews and focus groups are planned, to help investigate these areas further. The relationship between gender and performance in dental examinations is unclear, with the literature producing conflicting results. Sanders and Lushington[7] and Stewart et al.'s[8] findings were in agreement with our work, which observed gender not to predict end of year examination results.

The five-year dental undergraduate programme is lengthy, compared to most other university courses, which are predominantly of three years duration. Dental training is intense, involving long days, long terms and the pressures associated with hands-on clinical care. Care thus needs to be taken in generalising the findings of this work to students studying other disciplines.

It is intended to repeat the questionnaires with a second cohort of students to establish whether any patterns exist between the two groups. It would also be interesting to undertake a longitudinal study, to observe a group of students' progression from BDS1 to BDS5. This would help determine the manner in which the factors investigated in this study potentially vary from year to year.

CONCLUSIONS

Social distractions were the barrier most highly rated, by both males and females, as hindering effective study.

Levels of perceived stress were high among both male and female students, with female

students having significantly higher PSS scores than males. Difficulties with journey to university and family responsibilities were both significant predictors of PSS scores.

Social distractions were significantly related to examination performance; students that rated social distractions highly, performed less well in examinations.

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