Stress, Anxiety, and Psychological Wellbeing in First Year University Students: Changes Over Time

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High levels of stress in tertiary students are associated with ongoing mental health difficulties and impact on academic performance. The aim of this study was to assess the change in stress, anxiety, and psychological wellbeing of university students over a semester. Participants were 120 first year students who completed questionnaires at the beginning of the semester and again two days prior to their examination. Results showed that students had high levels of stress, anxiety, and poor psychological wellbeing at the beginning of the semester. Psychological wellbeing decreased significantly between the beginning and end of semester. Some students start the semester with poor mental health which does not improve, while others show a pattern of mental health that starts at healthy levels and declines over the semester. Different interventions may be required to meet the heterogenous mental health needs of university students.

Keywords: *Psychological Wellbeing; Stress; Anxiety; Tertiary Students*

Introduction

The transition from school to university education represents a major developmental milestone for many young people who undertake tertiary education. For most students this occurs at a time when they are furthering the significant developmental processes that begin in adolescence: developing independence, establishing meaningful relationships and working towards careers and employment. It also occurs at a time when young people are at risk of poor mental health. The majority of mental health problems begin in adolescents (Jones, 2013) and previous studies have shown that psychological wellbeing drops at times of transition (Cvetkovski, Jorm, & Mackinnon, 2019). Transition to tertiary education brings with it exposure to unfamiliar environments and social situations, a higher expectation of independence often in the absence of previously present family support as some young people move away from their family home. High levels of stress, anxiety and depression can negatively affect a young person's ongoing mental health, risk of psychological problems into the future as well as their current academic performance (Baker, 2003; Kötter et al., 2017; Sohail, 2013) and persistence with university studies (Rayle & Chung, 2007).

In their study of over 1,600 Turkish students Bayram & Bilgel (2008) found high prevalence rates of depression (27.1%), anxiety (47.1%) and stress (27%) using the Depression Anxiety and Stress Scale (DASS-42). First and second year students had the highest rates of these psychological difficulties relative to students who were post-second year university (Bayram & Bilgel, 2008).

Another study based at Cambridge University reported that student stress levels were elevated at the time of examinations (Surtees, Wainwright, & Pharoah, 2002). In first year undergraduate nutrition students in Australia stress rated weekly, was found to increase over the course of the 13 week semester with qualitative data from the same study indicating that assessment and examinations were a particular source of stress (Pitt et al., 2018). A study of Japanese medical students found that stress increased over the course of the university year, peaked before examinations and then declined over the following two weeks (Kato-Kataoka et al., 2016).

While an increase in reported stress levels prior to examinations may be expected in students, stress, including stress associated with examinations, is a significant health concern due to the comorbidity of stress with mental (i.e., depression and anxiety) and physical health problems in undergraduate students (Bayram & Bilgel, 2008). These psychological factors also impact student academic success and present a student retention issue for universities (Rayle & Chung, 2007).

Bronfenbrenner's ecological systems theory describes how children develop within a series of wider contexts including their family, local community and wider societal environment. More recently, the bio-ecological systems approach incorporates the individual biological traits of a young person into the developmental model (Patel, 2011). When considering university students transitioning into their first year of tertiary education, the bio-ecological model summarises the influences that potentially contribute to individual differences in responses to stress and patterns of psychological wellbeing. Research has demonstrated that personality factors such as extroversion and agreeableness interact with factors present in wider systems to influence how student's react to contextual factors such as examination stress (Temane & Wissing, 2008)

Previous studies have described higher rates of stress, anxiety, and depression in university students and the association of assessment and examinations with increased self-reported stress. Despite the high level of commonality of experienced stress in students, there is a need for quantitative examination of potentially differing patterns of psychological wellbeing. Understanding these patterns of psychological problems over time is necessary to assist in the effective design and implementation of interventions to address these problems.

Aims and Hypothesis

The aim of this study was to assess the change in stress, anxiety and psychological wellbeing in first year university students from the beginning of a semester to the end of semester prior to the final examinations. A further aim was to determine whether there was evidence of differing patterns of psychological wellbeing in students

We hypothesized that levels of poor psychological wellbeing (a marker for depression) and anxiety would also change over the course of a university semester in a similar way to previously reported changes in stress.

METHODS

Participants

Participants in this study were 120 first year students enrolled in a medical science course at the University of Auckland, New Zealand, representing approximately 10% of students enrolled in that course. The study was designed as a pilot study to test recruitment, retention and online data collection processes, to prepare for a future larger survey of stress and psychological health in university students.

Measures

Stress: The Perceived Stress Scale (PSS) is a 10 item questionnaire that asks about stress and coping in the previous month (Cohen, Kamarck, & Mermelstein, 1983). Scores range from 0 to 40 with higher scores being indicative of higher levels of stress. Scores from 0-13 are considered to be low stress, scores from 14-26 equate to moderate stress and scores from 27-40 equate to high stress.

Anxiety: The State Trait Anxiety Inventory 6 item version (STAI6) is a short 6 item scale validated as an anxiety screening questionnaire based on the longer State Trait Anxiety Inventory which is 20 items (Marteau & Bekker, 1992). A cut-off of score >50 was used as an indicator of clinically significant levels of anxiety.

Psychological Wellbeing: The World Health Organisation well-being index the WHO-5, is a five item, positively worded measure of psychological well-being which gives scores ranging from 0 to 25. Higher scores represent better well-being. Scores of 13 or lower indicate low levels of psychological well-being. A systematic review of the WHO-5 concluded that it was a widely used and sensitive measure of depression (Topp et al., 2015)

Procedure

The New Zealand university year begins in March and ends in November and is divided into two semesters with a total of 12 teaching weeks in each semester. A full-time course of study would typically involve taking four papers in each semester of a calendar year. Students were in the second semester of their first year at university in 2019. Information about the study was given to students in a lecture in the first week of the course and also via placement of the participant information sheet on the online resource page for the course. All consent and data collection were managed by a secure online database and students could give consent and answer questionnaires using their phone, tablet or computer. Participants provided baseline demographic information when enrolling in the study. Sex was reported as male, female or prefer not to say (unspecified). Ethnicity was recorded using New Zealand guidelines for prioritized ethnicity. It is common in New Zealand for individuals to identify with more than one ethnic group, in these cases ethnicity is determined in the following order of priority: Māori, Pacific Island, Asian, Other, New Zealand European. Students were asked if they were currently working (yes or no), currently living at home with family (yes or no), and whether they were intending to apply for a limited entry course of study at the end of the semester (yes or no). Students answered questions about stress, anxiety, and psychological wellbeing at enrollment and at the end of the semester two days prior to their final examination.

Ethical approval for the study was obtained from the University of Auckland Human Participants Ethics Committee (Reference ID 023233).

Statistical Analyses

Change in psychological measures: The change between scores at the beginning of the study and the end of the study was calculated for each of the three outcome measures by subtracting the score at the end of the study from the baseline score. All statistical analysis was conducted in SAS 9.4. Paired t-tests were used to

Table 1: Sample characteristics of participating students

	N	%
Ethnicity		
NZ Maori	13	10.8
Pacific Island	6	5.0
Asian	56	46.7
Other	11	9.2
NZ European	34	28.3
Sex		
Female	93	77.5
Male	25	20.8
Unspecified	2	1.7
Living at home		
No	50	41.7
Yes	70	58.3
Currently Working		
No	84	70.0
Yes	36	30.0
Applying for limited entry course		
No	41	34.2
Yes	79	65.8

examine the mean change in psychological outcomes. A Bland Altman plot was generated to examine whether psychological wellbeing scores changed in a similar way for all participants. Cross tabulated frequencies and percentages of students with categorized outcome scores at baseline and at the end of semester were produced to examine the number of students who changed from having low scores to high scores or moved in the opposite direction. Logistic regression models were used to analyse the association between categorical demographic factors and psychological health scores at baseline, tatistical significance was taken at the 5% level.

RESULTS

The characteristics of the study population are shown in Table 1. The majority of participants were female (77.5%), not currently working (70.0%), living at home with family (58.3%) and intending to apply for a limited entry course of study in the following year (65.8%). The largest ethnic group identified as Asian (46.7%) followed by New Zealand European (28.3%), Māori (10.8%), Other (9.2%) and Pacific Island (5.0%). Of the 120 students initially enrolled in the study 105 (87.5%) completed the end of study questions about stress, anxiety and psychological wellbeing. Those who completed the end of study questions did not differ significantly from those

Table 2: Mean change in psychological health outcomes

	N	Mean (*SD*) Baseline score	Mean (*SD*) End of study score	Change in score Mean (*SD*)	*p*-value
Stress	105	21.2 (6.4)	22.1 (6.3)	0.87 (5.2)	0.10
Anxiety	105	55.0 (12.3)	44.7 (13.6)	-10.4 (14.1)	<0.0001
Psychological Wellbeing*	105	13.1 (5.9)	10.4 (4.1)	-3.36 (5.0)	<0.0001

* Lower scores represent poor psychological wellbeing

Table 3: Change in categorized (perceived) stress scores over the semester

	End of Semester			
Start of Semester	**N(%) Low**	**N(%) Moderate**	**N(%) High**	**N(%) Row total**
Low	6 (35.3)	11 (64.7)	0 (0.0)	17 (16.2)
Moderate	4 (6.0)	45 (67.2)	18 (26.9)	67 (63.8)
High	0 (0.0)	10 (47.6)	11 (32.4)	21 (20.0)
Total	10 (9.5)	66 (62.9)	29 (27.6)	105 (100.0)

Table 4: Change in categorized anxiety and psychological wellbeing scores over the semester

Anxiety Scores			
Beginning semester	**End Semester**		
	Not anxious	**Anxious**	**Row total**
Not anxious	25 (69.4))	11 (30.6)	36 (34.3)
Anxious	42(60.9)	27 (39.1)	69 (65.7)
Total	67 (63.8)	38 (36.2)	105
Psychological Wellbeing			
Beginning semester	**End Semester**		
	Good	**Poor**	**Row total**
Good	19 (33.3)	38 (66.7)	57 (54.3)
Poor	6 (12.5)	42 (87.4)	48 (45.7)
Total	25 (23.8)	80 (67.2)	105 (100.0)

Table 5: Association between student factors and psychological health outcomes

	Stress			Anxiety			Psychological wellbeing		
	Estimate	***SE***	***p*-value**	**Estimate**	***SE***	***p*-value**	**Estimate**	***SE***	***p*-value**
Sex									
Female	4.91	1.34	0.0004	-7.41	2.68	0.01	-0.42	1.14	0.72
Male	Ref			Ref			Ref		
Ethnicity			0.08			0.49			0.61
NZ Maori	0.19	1.99	0.92	-3.58	-2.01	0.62	-1.03	1.65	0.53
Pacific Island	-0.22	2.71	0.94	3.05	5.29	0.33	-2.36	2.23	0.29
Asian	-0.08	1.33	0.95	-1.37	-2.03	0.45	-1.30	1.10	0.24
Other	5.66	2.12	0.01	3.79	4.27	0.23	-2.30	1.75	0.19
NZ European	Ref			Ref			Ref		
Living at home									
Yes	Ref			Ref			Ref		
No	-2.84	1.13	0.01	2.06	2.27	0.36	0.41	0.93	0.66
Working									
Yes	Ref			Ref			Ref		
No	-1.41	1.24	0.26	0.13	2.45	0.95	-0.10	1.00	0.92
Competitive course									
No	-0.53	1.20	0.66	5.25	2.32	0.03	1.06	0.96	0.27
Yes	Ref			Ref			Ref		

who did not in baseline stress scores (p=0.54), baseline anxiety scores (p=0.85), baseline psychological wellbeing (p=0.58) or sex (p=0.98).

Stress scores at baseline showed a modest correlation with psychological wellbeing scores (r= -0.40. p<0.0001) and anxiety scores (r -0.57, p<0.0001). Anxiety scores were modestly correlated with psychological wellbeing scores (r -0.41, P<0.0001).

The prevalence of high levels of stress, anxiety, and poor wellbeing above the established cut-offs at the beginning of the semester was high (20.0%, 66.7% and 44.2% respectively). Table 2 shows the mean stress, anxiety and psychological wellbeing scores at baseline and the end of the semester.

Although overall levels of stress for the group did not change significantly between the beginning and end of the semester (Table 2), psychological wellbeing decreased for students by an average of 3.36 points (p<0.0001) and anxiety decreased by an average of 10.4 points (p<0.0001). Some students show different patterns of psychological outcomes. Table 3 shows the number and percentage of students with low, moderate and high stress levels at the beginning and end of the semester. For those 67 students with moderate stress levels at baseline a small number reported an improvement in stress levels (6.0%) by the end of semester, most reported stress levels remaining in the moderate range (67.2%) and over a quarter reported stress levels that increased to high levels (26.9%). None of the students who reported low levels of stress at the beginning of the semester moved into the high stress group. Furthermore, all students who had high stress scores at the beginning of semester continued to have moderate or high levels of stress at the end of the semester.

Of the students who started the semester with low levels of anxiety 69.4% continued to report low levels of anxiety at the end of semester while 30.0% reported they had high levels of anxiety at the end of semester. For psychological wellbeing 33.3% continuing to report good wellbeing while 66.6% reported a worsening of psychological wellbeing (Table 4). Figure 1 shows the average psychological wellbeing score for each subject compared with the change in score from beginning to end of the semester. It shows, in general, subjects with high scores (better psychological wellbeing) had the greatest decrease in scores (p<0.001). In contrast those with low scores (poor psychological wellbeing) tended to stay the same. The figure also shows the mean decrease (i.e. deterioration) of 3.36 points across all subjects.

Table 5 shows the relationship between demographic and student factors and each of the mental health outcomes: stress, anxiety, and psychological wellbeing. Being female and living away from home were significantly associated with higher stress scores at the beginning of the university semester. Conversely, female students reported significantly lower anxiety scores than males at the beginning of the semester. Students who were intending to apply for a competitive entry course the following year had significantly lower anxiety scores as the semester began. None of the

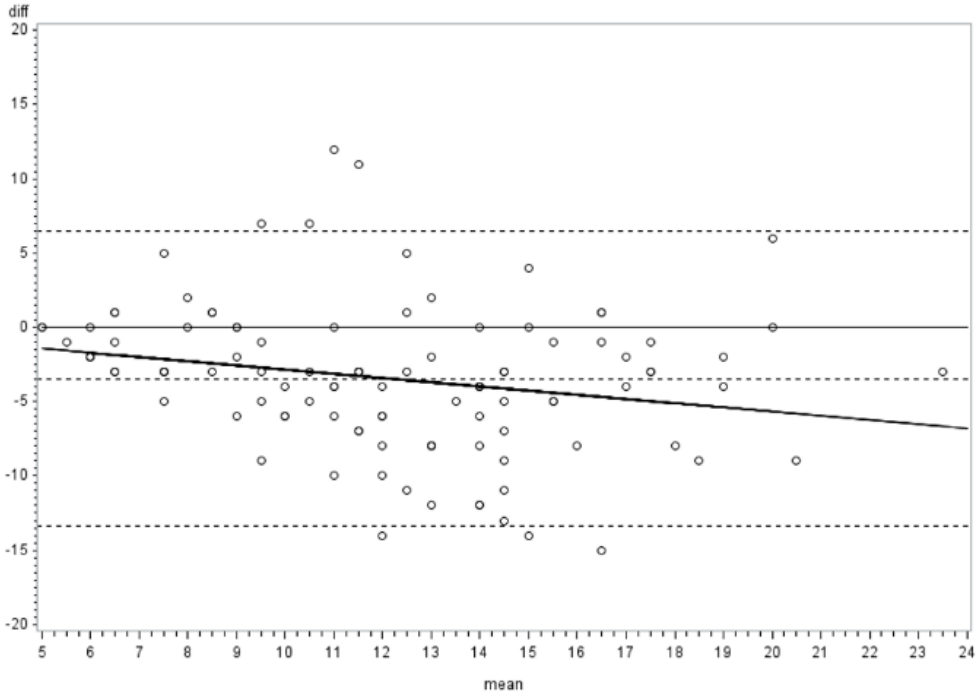

Figure 1: Average psychological wellbeing score for each student compared with the change in score from beginning to end of the semester

demographic or student factors were significantly associated with psychological wellbeing scores at the beginning of the semester.

DISCUSSION

We found high rates of stress, anxiety, and poor psychological wellbeing in this sample of first year university students. This is consistent with previous literature indicating high levels of stress in university students including stress associated with examinations (Gallagher et al., 2019; Kato-Kataoka et al., 2016; Pitt et al., 2018; Surtees et al., 2002). We measured stress, anxiety, and poor psychological wellbeing at two time points: the beginning of the semester and just prior to end of semester examinations. Mean stress scores did not significantly change over the course of the semester. While our results suggest that there is a decrease in psychological wellbeing over the semester, we did not measure psychological outcomes at multiple time points and levels of these psychological states may fluctuate during the semester. Pitt et al. (2018) measured stress weekly over the course of a university semester and found a trend for increasing stress over the semester. Our findings suggest that poor psychological wellbeing (a correlate of depressive symptoms) followed a similar pattern to stress scores and were worse at the end of semester prior to examinations than at baseline.

The finding that anxiety levels were lower at the end of the study just prior to examinations is interesting. This may reflect the different time scale used in reporting of anxiety on the STAI6. Students are asked to rate how they feel right now, in this moment when they answer the six anxiety questions. This is in contrast to the PSS which asks students to think about stress in the previous month, and the WHO5 that asks about the previous two weeks. It is possible that when students were reporting about their recent feelings over the previous weeks they had experienced a busy time with end of semester lectures, assignments, and exam preparation. When asked about how they were feeling in that moment their anxiety scores may have been lower because they were more prepared for their examinations. A second reason why anxiety scores may have improved at the end of the semester could be that physiological feelings of emotional arousal were more prominent at the beginning of the semester while at the end of semester students felt fewer of these physical symptoms of anticipation and emotional arousal.

A further important finding to emerge from this study is that not all students follow a pattern of decreasing psychological wellbeing and increasing levels of stress and anxiety over a semester and leading up to examinations. Students who start the semester with good psychological wellbeing show the greatest decrease in wellbeing while those who begin the semester with low wellbeing scores tend to continue to have poor psychological wellbeing. This finding, which is supported by the quantitative data analysis, extends our understanding of psychological health in university students by demonstrating evidence of differing patterns of wellbeing.

These results suggest that when planning interventions for mental health in tertiary students the group of students are not homogenous. Some will require treatment of current problems while others would benefit from prevention of a worsening of psychological health. Previous researchers have noted the importance of a suite of interventions to improve psychological health of university students (Gallagher et al., 2019; Moir et al., 2018; Turner & McCarthy, 2017). This forms the basis of a sensible approach given that not all interventions will

appeal to all students or target their specific needs. Similarly, adjustments to curricula aimed at improving psychological wellbeing of students need to reflect the diversity in courses of study and be tailored to suit the needs of students taking different courses.

In their study of Australian first year university students Pitt et al. (2018) used a mixed methods approach to examine the course and sources of stress for students. In addition to an overall trend for increasing stress over the semester the sources of stress for students differed at different time points during the semester for example financial strain and stress associated with assessments fluctuated (Pitt et al., 2018). This would further suggest that access to a range of interventions to assist with varying levels of stress with different etiologies is likely to capture more students. Turner et al (2017) found in their review that there was evidence of effectiveness for interventions addressing specific stressors including curriculum modifications and for those that aim to improve students' coping skills. They report little evidence supporting the effectiveness of interventions that target reappraisal of stress (Turner & McCarthy, 2017). In a high quality randomized controlled trial of a mindfulness based intervention for resilience to stress in UK university students Galante et al (2018) found the intervention significantly reduced self-reported stress before examinations with a moderate effect size compared to support as usual. Of those students assigned to the mindfulness intervention, 41% did not complete at least half of the intervention indicating that adherence is an issue for a reasonable proportion of students (Galante et al., 2018).

In our sample, students not living at home reported higher levels of perceived stress at baseline. There was no significant association between living at home and either anxiety or psychological wellbeing. In a study of Australian university students, those living away from home with perceived little parental financial support had the lowest self-rated psychological wellbeing. Students living at home had the highest level of psychological wellbeing, and perceived financial support from parents was not a significant factor influencing stress for those who lived at home (Stewart et al., 1999)

We found that female students reported higher levels of stress, but not anxiety or poor wellbeing than male students. It is possible that female students either experience more stress than male students or are more readily able to identify feelings of stress. Previous studies have reported mixed results for sex differences in anxiety and depression. Bayram and Bilgel (2008) reported that female students in their sample had higher stress and anxiety scores, but not depression scores, than males. By contrast, a later study reported higher depression scores in females but no difference in anxiety scores between males and females (Roy, 2015). It is possible that sex differences in these psychological measures are also influenced by multiple factors including year of study, course of study, ethnicity and age. The complex and nuanced nature of the etiology and measurement of stress and psychological wellbeing further supports the need for a multi-pronged approach to student support at university to increase the likelihood that interventions will support both male and female students.

The limitations of this study need to be acknowledged. We had a relatively small sample size and enrolled the first 120 students to consent to participation, this may have resulted in students who were feeling more stressed or who were focused on their mental health enrolling in the study. For this reason, they may not be an accurate representation of the wider group of first year university students. However, our results are consistent with previous studies that have reported high levels of stress and worry in university students (Bayram & Bilgel, 2008; Denovan et al., 2017).

Students for this study were recruited from a single medical science paper, their stress anxiety, and psychological wellbeing levels may not be representative of all university students and may reflect inflated scores on these measures. Previous studies have reported higher prevalence of depression among medical students (Rotenstein et al., 2016) and it may be that this cohort of students, many of them aiming to enter health professions, have higher rates of depression than the general population of university students.

Conclusion

This study suggests that psychological wellbeing decreases prior to university examinations. Our findings extend the current literature by suggesting that students are not homogenous in their patterns of psychological health, there are a group of students who begin the university semester with high levels of stress, anxiety and poor wellbeing these students may respond to different intervention strategies than those who follow a pattern of low or moderate stress, anxiety, and poor wellbeing that worsens as final exams approach. Future studies should examine variation in causal pathways for students with different trajectories of wellbeing. Interventions to target stress and poor psychological health in university students should be wide ranging to allow for the heterogenous needs of university students.

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Availability of Data
Data can be made available by request to the authors

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