Sleep hygiene mediates the relationship between perceived academic stress and insomnia symptom severity among Pasifika students in Aotearoa New Zealand

Ilaisaane F Fakapulia, Latika Samalia, and Erik Wibowo

Department of Anatomy, University of Otago

Many Pasifika students in Aotearoa New Zealand face challenges in their tertiary education. Their academic stress may potentially affect their wellbeing. Using a cross-sectional approach, we aimed to explore the proportion of Pasifika students with insomnia symptoms in the Department of Anatomy at the University of Otago, and whether their academic stress and sleep hygiene were associated with their insomnia symptoms. A brief (10-15 min) online survey was sent to 101 Pasifika science students at second- and third-year undergraduate levels in our department. Data from 57 Pasifika students (21.1 ± 1.6 years old; 28.1% Samoan, 26.3% Tongan, 24.6% Fijian) were assessed. The proportions of Pasifika students with no, mild, moderate, and severe insomnia symptoms were 15.8%, 35.1%, 31.6%, and 7% respectively. Insomnia symptoms correlated with higher levels of stresses related to students' academic self-perceptions. Insomnia symptom severity also correlated with sleep hygiene, especially: going to and getting out of bed at irregular times, staying in bed longer than necessary, consuming alcohol/tobacco/caffeine close to bedtime, going to bed feeling distressed, sleeping in an uncomfortable bed, and worrying while in bed. Sleep hygiene mediated the relationship between perceived academic stress and insomnia symptom severity. Pasifika science students in Aotearoa New Zealand may be at elevated risk of having insomnia symptoms due to academic stress. Sleep hygiene education may potentially help improve their wellbeing.

Keywords: *Academic stress; Pasifika students; insomnia symptoms; sleep hygiene; ethnic minority*

INTRODUCTION

The number of people in Aotearoa New Zealand who identify as Pasifika as their ethnicity is increasing, with ~8% in 2021 (Stats NZ, 2018b). According to Airini et al (2010), the term Pasifika refers to "peoples who have migrated from Pacific nations and territories…[and] New Zealand-based (and born) population, who identify as Pasifika, via ancestry or descent" (page 49). Similarly, the enrolment of Pasifika students at Te Whare Wānanga o Otāgo (the University of Otago) is also increasing, approximately 6% in 2021 (University of Otago, 2023). In our department (Te Tari Kikokiko, the Department of Anatomy), there are approximately 90-100 Pasifika students at second- and third-year undergraduate levels each year.

Pasifika students in Aotearoa New Zealand, however, are overrepresented in poor academic outcomes. For example, data from the First Year Health Sciences programme (Sopoaga et al., 2013) and anatomy courses (Time et al., 2023) at the University of Otago show that Pasifika students have lower academic performance than New Zealand European students. Similarly, data from Te Wānanga Aronui o Tāmaki Makau Rau (the Auckland University of Technology) also show that Pasifika students in a Human Anatomy and Physiology course have lower academic grades than Māori and Pākehā students (Brown et al., 2018). Furthermore, Pasifika students are more likely to leave tertiary studies without a qualification compared to Pākēha students (Benseman et al., 2006).

Various factors may influence academic outcomes among Pasifika students. How education is approached differs between the Western and Pacific frameworks. As in other institutions in Aotearoa New Zealand, the University of Otago was built within a Western framework and often does not take into account indigenous values in the learning environment. Pasifika student success requires a holistic learning environment that incorporate building relationships with academics, a welcoming environment, and teaching practices which are culturally appropriate to Pacific cultures (Alkema, 2014). These differences in academic approaches may potentially lead to Pasifika students struggling to adapt to the Western-style education system. Additional factors that may lead to lower academic performances and ultimately withdrawal from study among Pasifika students include motivation, family pressure, financial hardship, and lack of support (Benseman et al., 2006). Furthermore, Pasifika students at our institution may have additional stressors because the majority come from a place with strong Pacific cultures, but Dunedin only has ~3% Pacific communities (Stats NZ, 2018a), and thus they may need to adjust culturally too.

Currently, how academic stress among Pasifika students influences their wellbeing is not yet documented. Data from other university students overseas show the

association between poor sleep and academic performances (BaHammam et al., 2012; Okano et al., 2019). Thus, there is a possibility that the academic struggles among Pasifika students may affect their wellbeing, including their sleep.

In this study, we aim to investigate the proportion of Pasifika students with insomnia symptoms in our department, and whether their academic stress and sleep hygiene are associated with their insomnia symptoms. According to the International Classification of Diseases 11, insomnia disorders are "characterised by the complaint of persistent difficulty with sleep initiation, duration, consolidation, or quality that occurs despite adequate opportunity and circumstances for sleep, and results in some form of daytime impairment" (World Health Organization, 2021). In this study, we measured symptoms of insomnia using the Insomnia Severity Index (ISI) (Bastien et al., 2001), which can assess subjective report of nocturnal and diurnal symptoms of insomnia. Academic stress was measured using the Perceived Academic Stress Scale (Bedewy & Gabriel, 2015), which collects information on stresses related to pressures to perform well, excessive workloads or assessments, self-confidence of success, and time restraints for academic works. Potentially, these stresses may affect students' psychological wellbeing. Sleep hygiene includes behaviours and lifestyles that may potentially affect sleep quality, and we measured sleep hygiene using the Sleep Hygiene Index (SHI) (Mastin et al., 2006). Frequent engagement in these behaviours may worsen sleep quality, and consequently students' wellbeing.

We are also interested to determine if sleep hygiene is a mediator for the relationship between academic stress and insomnia symptoms because academic stress may potentially influence behaviours that are related to sleep. Data from our study may potentially highlight that Pasifika students may need additional support during their study, not just academically, but also for their wellbeing. Improvement in their academic performance may potentially better their overall wellbeing. Our findings should also be relevant to other under-represented ethnic minority students or international students in other countries.

METHOD

Participants

Participants information can be found in the Results section below.

Materials

Participants completed an online survey that took approximately 10-15 minutes to complete. Once the link was clicked, they viewed a screening question: "The following statements relate to the 200- and 300- levels papers you are studying this year (2021). Please select an option which is applicable to you, with the options "I am currently taking one or more anatomy papers at 200- and 300-levels", "I took one or more anatomy papers at 200- and 300-levels last semester", and "I have not taken any anatomy paper at 200- and 300-levels". Only those selecting the first two options viewed the Participant Information Sheet and the consent form. Only those who consented to the study had access to the questionnaires.

Demographic

Demographic information including age, ethnicity, gender, courses they had taken, place of birth, primary place of growing up, sexual orientation, and relationship status were collected by self-report. We used the categories for ethnicities from Statistics New Zealand where each participant may select multiple ethnicities. A total of 18 participants had Pacific ancestry and also selected another ethnicity such as Māori, New Zealand European, or Asian.

Perceived Academic Stress

Academic stress was assessed using the Perception of Academic Stress Scale (Bedewy & Gabriel, 2015), which has three subscales for stresses related to academic expectations (e.g., unrealistic expectation from parents or teachers), faculty work and examination (e.g., insufficient time for academic work, excessive workload), and students' academic self-perception (e.g., confidence in being success as a student or in future career). This scale has 18 items related to academic stress. Each can be rated on a 5-point scale ranging from "strongly disagree" to "strongly agree". Five items were reverse-scored. The internal consistency in our sample was $\alpha = 0.795$.

Insomnia Severity Index

Insomnia symptoms (e.g., difficulty falling asleep, staying asleep, problems with waking too early, and satisfaction with current sleep pattern) in the past two weeks were measured using the Insomnia Severity Index (ISI) (Bastien et al., 2001). Each item was rated on a scale from 0-4, with a higher score indicating more severe insomnia symptoms. The cut-off scores for no, mild, moderate and severe insomnia symptoms were 0-7, 8-14, 15-21, and 22-28, respectively. The internal consistency in our sample was $\alpha = 0.820$.

Sleep hygiene

The SHI (Mastin et al., 2006) asked how frequently the participant engaged in 13 behaviours that could potentially affect their quality of sleep. Each item was rated on a 5-point scale; ranging from 'never' to 'always'. Examples of the items include statements about going to bed at inconsistent times, going to bed while distressed, sleeping in an uncomfortable bedroom or on an uncomfortable bed, and doing important work close to bedtime. A higher score indicated worse sleep hygiene. The internal consistency in our sample was $\alpha = 0.753$.

Procedure

We distributed an online survey to Pasifika students in our department. The survey was approved by the University of Otago Human Ethics Committee (D21/245) and built using the Research Electronic Data Capture (REDCap) database. The survey link generated from REDCap was then distributed via email to 101 second- and third-year Pasifika undergraduate students. The Biomedical Otago Pasifika Students Association also helped distributed the survey in their mailing lists. Each participant received a $25 gift card as koha.

The survey was active from August 2021 to September 2021. This period was approximately mid-to-late semester at our institution. During this time, Aotearoa New Zealand was under Level 2 restriction of the COVID-19 pandemic. Within this period, 75 people accessed the survey link,

and 59 consented to the study. Two participants were removed because they did not answer any questions.

Data analyses

Data were analysed using SPSS (IBM version 25). Data from 57 participants were analyzed in this study (56.4% response rate). Demographic data and the proportion of students with insomnia symptoms were summarized using descriptive statistics. No sex difference was found in the scores for insomnia severity, sleep hygiene and perceived academic stress. Pearson's correlation analyses were used to determine how insomnia symptoms correlate with perceived academic stress and sleep hygiene.

Mediation analysis was conducted, using the method outlined in Baron and Kenny (1986) followed by the Sobel test, to indicate whether sleep hygiene mediated the association between perceived academic stress and insomnia symptoms. No covariate was included because of the small sample size. $P < 0.05$ was considered significant.

RESULTS

Participants were 57 Pasifika students at the University of Otago (see Table 1). Participants ranged in age from 19 to 26 years of age with an average of 21.1 (*SD* = 1.6) years old (41 participants provided age information). The three most represented ethnicities were Samoan (28.1%), Tongan (26.3%), and Fijian (24.6%). Among our participants, 35.1%, 57.9%, and 1.8% identified as male, female, and akava'ine (third gender of Cook Islands Māori descent) respectively. Most of participants (61.4%) were born in Aotearoa New Zealand (all born outside of Dunedin), 28.1% in the Pacific Islands and 5.3% stated other locations. In addition, 5.3% of participants indicated that their primary place of growing up was in Dunedin, 28.1% in the Pacific Island, and the majority in Aotearoa New Zealand other than Dunedin (57.9%). Furthermore, 57.9% of participants were in a relationship. In term of sexual orientation, 73.7% were heterosexual, 3.5% were gay/lesbian, and 5.3% were bisexual. Among our participants, 91.2% had taken second-year anatomy papers, and 47.4% had taken third-year anatomy papers.

Table 1. *Demographic data of participants*

Variables	*N*	%
Ethnicities		
Pacific peoples, not further defined	3	5.3
Samoan	16	28.1
Cook Islands Māori	7	12.3
Tongan	15	26.3
Niuean	2	3.5
Tokelauan	2	3.5
Fijian	14	24.6
Solomon Islander	1	1.8
Māori	4	7.0
New Zealander European	7	12.3
Asian	6	10.5
Other ethnicity	1	1.8
Gender		
Male	20	35.1
Female	33	57.9
Aka'vaine	1	1.8
Missing	3	5.3
Anatomy papers taken		
200-level papers	52	91.2
300-level papers	27	47.4
Place of birth		
Dunedin	0	0
New Zealand, other than Dunedin	35	61.4
Pacific Island	16	28.1
Other	3	5.3
Place grow up		
Dunedin	3	5.3
New Zealand, other than Dunedin	33	57.9
Pacific Island	16	28.1
Other	2	3.5
In a relationship		
Yes	21	57.9
No	33	36.8
Sexual orientation		
Prefer not to answer	3	5.3
Heterosexual	42	73.7
Gay/Lesbian	2	3.5
Bisexual	4	5.3
Other	1	2.0
Missing	6	10.5

As shown on Figure 1, there were high proportions of insomnia symptoms in our participants with 35.1% reporting mild, 31.6% moderate, and 7.0% severe insomnia symptoms. The severity of insomnia symptoms correlated with perceived academic stress ($r = .390$, $p < .01$) and sleep hygiene scores ($r = .627$, $p < .001$). Table 2 indicates that insomnia symptoms correlated positively with stresses related to students' academic self-perception ($r = .426$, $p < .01$). In addition, insomnia symptom severity correlated with poor sleep hygiene behaviours: going to bed ($r = .380$, $p < .01$) and getting out of bed ($r = .534$, $p < .001$) at irregular times, staying in bed longer than necessary ($r = .533$, $p < .001$), consuming alcohol/tobacco/caffeine close to bedtime ($r = .340$, $p < .05$), going to bed feeling distressed ($r = .628$, $p < .001$), sleeping in an uncomfortable bed ($r = .332$, $p < .05$), and worrying while in bed ($r = .295$, $p < .05$).

Figure 2 shows the association between perceived academic stress and insomnia symptoms was mediated by sleep hygiene. The total effect of perceived academic stress on insomnia symptoms was 3.972 (95% *CI*: 1.282, 6.661), meaning insomnia symptom severity was expected to increase by 3.972 per unit increase of perceived academic stress. The direct effect of perceived academic stress on insomnia symptom severity after adjusting for sleep hygiene was 2.295 (95% *CI*: -.018, 4.608). The indirect effect of perceived academic stress through sleep hygiene was 1.676 (95% *CI*: -.130, 3.481).

Table 2. *Correlation coefficients between insomnia symptom severity and both sleep hygiene and academic stress.*

Subscale/Item	Correlation coefficient
Perceived academic stress subscales	
Stresses related to academic expectation	.213
Stresses related to faculty work and examination	.223
Stresses related to students' academic self-perceptions	.426**
Sleep hygiene items	
I take daytime naps lasting 2 or more hours	.115
I go to bed at different times from day to day	.380**
I get out of bed at different times	.534***
I exercise to the point of sweating within 1hr of going to bed	.012
I stay in bed longer than I should more than twice a week	.533***
I use alcohol, tobacco or caffeine within 4 hours of going to bed	.340*
I do something that may wake me up before bedtime	.228
I go to bed feeling stressed, angry, upset or nervous	.628***
I use my bed for things other than sleep or sex	.197
I sleep on an uncomfortable bed	.332*
I sleep in an uncomfortable bedroom	.241
I do important work before bedtime	.182
I think, plan or worry when I am in bed	.295*

*Significant associations between insomnia symptoms and the independent variable, $p < .05$; ** $p < .01$; *** $p < .001$

Figure 1. Proportion of different insomnia symptom severity among Pasifika students in our sample.

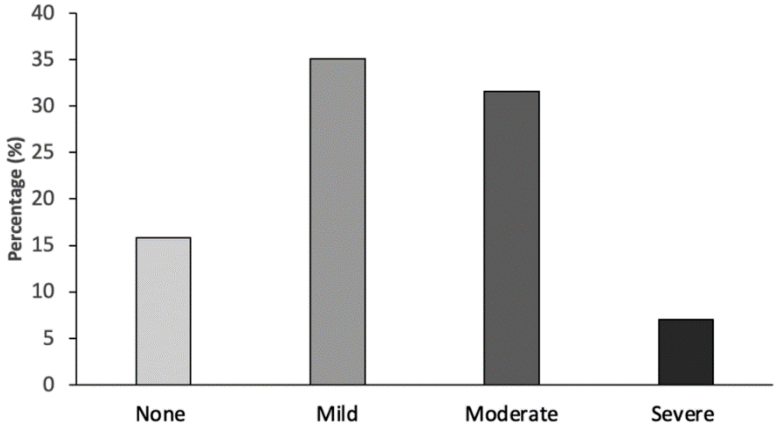
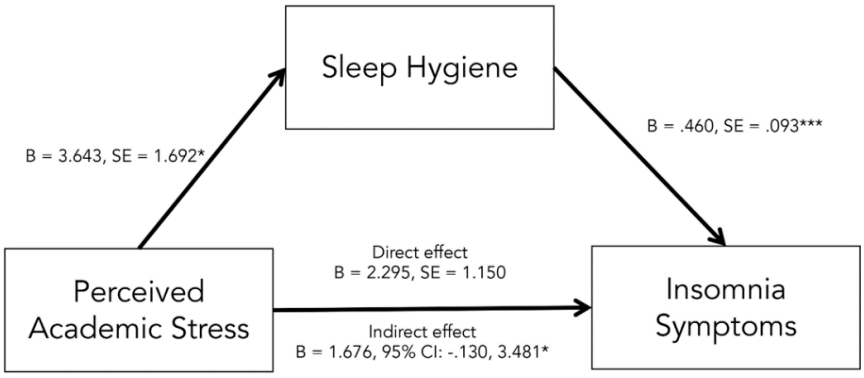


Figure 2. Sleep hygiene mediated the relationship between perceived academic stress and insomnia symptoms.



DISCUSSION

There are a few main findings from this study. First, self-reported insomnia symptoms are common among the Pasifika student cohort from our department, with 38.6% of our participants reported of having moderate-to-severe insomnia symptoms. Second, insomnia symptoms correlated with stresses associated with students' academic self-perceptions, and various sleep hygiene behaviours. Third, sleep hygiene mediated the relationship between perceived academic stress and insomnia symptoms among Pasifika students. These findings highlight the importance of supporting under-represented Pasifika students in Aotearoa New Zealand as their wellbeing may be significantly impacted if they face academic struggles. In addition, our findings may be relevant to other under-represented ethnic minority students such as Māori or international students in our institutions or elsewhere.

Insomnia symptoms and perceived academic stress

Of major concern in this study is the high proportion of insomnia symptoms in our sample. While we cannot compare this proportion with students of other ethnicities in the same cohort, such a proportion is higher than the proportion in the general population in Aotearoa (27.2%) (Paine et al., 2005) or medical students in our institution (49.5%) (Duthie et al., 2022). This finding emphasizes the critical needs for our institution to provide support for Pasifika students so they can have better wellbeing during their study. The Otago Medical School, for example, offers a module on self-care for medical trainees. A similar seminar or workshop could potentially be offered to Pasifika students at the beginning of a semester so they can have tools for managing their sleep on their own, for example through sleep hygiene education or relaxation techniques.

The finding that high academic stress is linked to more severe insomnia symptoms is not totally surprising. Poor sleep have been known to be linked to lower academic marks in university student populations in the US (BaHammam et al., 2012; Okano et al., 2019). For example, medical students who perform well academically sleep earlier, and sleep for a longer duration than those achieving lower marks (BaHammam et al., 2012). In addition, Li et al. (2016) also showed that academic stress is associated with poor sleep quality among university students in China. These findings suggest that academic stress may influence sleep in students across cultures.

In this study, we showed that stresses related to students' academic self-perceptions correlate with insomnia symptom severity among Pasifika students. The items in this subscale are related to their confidence to succeed academically and future career (Bedewy & Gabriel, 2015). Another study had previously shown that poor academic self-perception is related to psychological distress (Yamada et al., 2014), which could potentially be linked to poor sleep too. We did not find a similar relationship for stresses related to academic expectation (i.e., those associated to pressures from family, peers, teachers) or faculty work and examinations (i.e., those related to workload). This is probably because these later subscales measure external factors rather than students' internal assessment of their performance.

As noted in the Introduction, Pasifika students continue to be over-represented in poor academic outcomes in Aotearoa New Zealand (Benseman et al., 2006; Brown et al., 2018; Sopoaga et al., 2013; Time et al., 2023). At our institution, many departments (including ours) have Pasifika student liaisons who help answer queries related to the academic matters of Pasifika students, and the university's Pacific Islands Centre also organizes tutorials for Pasifika students. Additional initiatives to improve student's academic outcomes could potentially be explored. For example, bridging programmes could be developed to help students transition from lower to higher undergraduate levels. Undoubtedly the type of learning and assessment styles change as students proceed to more senior levels. Thus, students may benefit from additional preparation for later undergraduate levels. Similar programmes have been successfully offered in other institution overseas (Ashley et al., 2017; Bradford et al., 2021; Strayhorn, 2011), so this could be one way that our institution could explore. Hypothetically, if their academic outcomes are improved, their psychological wellbeing may potentially be better as well.

Our team is currently conducting a study to explore the study habits of Pasifika students as well as their perception on various anatomical topics. Identifying these may help us develop a plan to improve their academic support. We also recognize that some topics covered in our anatomy courses may be considered as taboo (*tapu*) for Pasifika students. These include the use of cadavers (*tūpāpaku*) in laboratory teaching and the discussion of head and reproductive anatomy. It remains to be determined if students who are uncomfortable studying these topics may have elevated academic stress.

Sleep hygiene as a mediator

The mediating effect of sleep hygiene on the relationship between perceived academic stress and insomnia symptom severity warrants an in-depth discussion. There is a possibility that students with high academic stress may engage in behaviours that are related to poor sleep. For example, if they procrastinate completing an assignment or studying for an exam, they may go to sleep late, consume caffeinated drinks close to bed time in order to stay awake for studying, or being distressed in the evening. Indeed, our correlation analyses confirm that more severe insomnia symptoms are related to frequently going to bed and getting out of bed at inconsistent times, staying in bed longer than necessary, consuming alcohol/tobacco/caffeine close to bedtime, going to bed feeling distressed, sleeping in an uncomfortable bed, and worrying while in bed. Considering that this survey was launched in mid-to-late semester, students might have had more assessments due during our recruitment period, and thus they might have elevated stress levels.

We also recognize that religion is an important aspect among Pasifika students. In the most recent census by Stats NZ, almost 80% of Pacific peoples in Aotearoa New Zealand have religious affiliation (Stats NZ, 2018b). Considering that Pasifika population in Dunedin is small, one of the ways Pasifika students can meet Pacific peoples

is through church affiliation. Anecdotally, church activities and responsibilities often take precedence when these things arise and, for Pasifika students, they must drop what they are doing and attend to them (Evans, 2018). Consequently, these commitments may lead to students getting home late, and thus they have to stay up later to study, affecting their sleep hygiene.

Limitations

Our study has several limitations. First, our sample size is small, which limits our statistical analyses. However, this is expected as the Pasifika students in our department are ethnic minorities, so their numbers are expected to be smaller than New Zealand European students. Suffice to say, we sent out the survey to 101 students, and recruited over 50% of them. Secondly, we did not recruit students of other ethnicities for comparison. Thus, from the data collected here, we cannot conclude that the findings are unique to Pasifika students. However, given the similarities in cultures, some results may be similar to Māori students. Thirdly, our data are based on self-report, and scales like the ISI have limitations. For example, the ISI cannot separate primary and comorbid insomnias (Morin et al., 2011), and participants were not asked if they had been clinically diagnosed with insomnia, thus those who had elevated ISI scores might not necessarily have insomnia. A future study using objective measures such as polysomnography or actigraphy would help determine how specific sleep parameters are most affected during their study.

Conclusion

In conclusion, our findings provide evidence that a high proportion of Pasifika students in our department have some level of insomnia symptoms. Additionally, sleep hygiene mediates the association between perceived academic stress and insomnia symptom severity. Based on these findings, academic support to Pasifika students may potentially reduce their academic stress and subsequently improve their wellbeing including sleep. Institutions in Aotearoa New Zealand or elsewhere should ensure that their under-represented students (such as ethnic minority or international students) are well-supported during their study. While academic support is important, students may also benefit from initiatives (e.g., workshop or seminar) that are designed to improve their wellbeing.

References

Airini, Anae, M., Mila-Schaaf, K., Coxon, E., Mara, D., & Sanga, K. (2010). *Teu Le Va - Relationships across research and policy in Pasifika education*. Retrieved from https://www.educationcounts.govt.nz/__data/assets/pdf_file/0009/75897/944_TeuLeVa-30062010.pdf

Alkema, A. (2014). *Success for Pasifika in tertiary education: Highlights from Ako Aotearoa-Supported Research*. Retrieved from https://ako.ac.nz/assets/Reports/Synthesis-reports/SYNTHESIS-REPORT-Success-for-Pasifika-in-tertiary-education-Highlights-from-Ako-Aotearoa-supported-research.pdf

Ashley, M., Cooper, K. M., Cala, J. M., & Brownell, S. E. (2017). Building better bridges into STEM: A synthesis of 25 years of literature on STEM summer bridge programs. *CBE—Life Sciences Education, 16*(4), es3. https://doi.org/10.1187/cbe.17-05-0085

BaHammam, A. S., Alaseem, A. M., Alzakri, A. A., Almeneessier, A. S., & Sharif, M. M. (2012). The relationship between sleep and wake habits and academic performance in medical students: A cross-sectional study. *BMC Medical Education, 12*, 61. https://doi.org/10.1186/1472-6920-12-61

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182. https://doi.org/10.1037//0022-3514.51.6.1173

Bastien, C. H., Vallieres, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine, 2*(4), 297-307. https://doi.org/10.1016/S1389-9457(00)00065-4

Bedewy, D., & Gabriel, A. (2015). Examining perceptions of academic stress and its sources among university students: The Perception of Academic Stress Scale. *Health Psychology Open, 2*(2), 2055102915596714. https://doi.org/10.1177/2055102915596714

Benseman, J., Coxon, E., Anderson, H., & Anae, M. (2006). Retaining non-traditional students: Lessons learnt from Pasifika students in New Zealand. *Higher Education Research & Development, 25*(2), 147-162. https://doi.org/10.1080/07294360600610388

Bradford, B. C., Beier, M. E., & Oswald, F. L. (2021). A Meta-analysis of University STEM Summer Bridge Program Effectiveness. *CBE—Life Sciences Education, 20*(2), ar21. https://doi.org/10.1187/cbe.20-03-0046

Brown, S. J., Power, N., Bowmar, A., & Foster, S. (2018). Student engagement in a Human Anatomy and Physiology course: a New Zealand perspective. *Advances in Physiology Education, 42*(4), 636-643. https://doi.org/10.1152/advan.00035.2018

Duthie, C. J., Cameron, C., Smith-Han, K., Beckert, L., Delpachitra, S., Garland, S. N., . . . Wibowo, E. (2022). Sleep management strategies among medical students at the University of Otago. *Behavioral Sleep Medicine, 21*(4), 448-459. https://doi.org/10.1080/15402002.2022.2127723

Evans, B. (2018). *An examination of the complex web of influences on the educational achievement of Samoan and Tongan male students in Auckland secondary schools.* (Doctor of Philosophy (Education)), Unitec Institute of Technology, Auckland.

Li, J., Zhou, K. N., Li, X. M., Liu, M., Dang, S. N., Wang, D. L., & Xin, X. (2016). Mediator effect of sleep hygiene practices on relationships between sleep quality and other sleep-related factors in Chinese mainland university students. *Behavioral Sleep Medicine, 14*(1), 85-99. https://doi.org/10.1080/15402002.2014.954116 https://doi.org/10.1080/15402002.2014.954116

Mastin, D. F., Bryson, J., & Corwyn, R. (2006). Assessment of sleep hygiene using the Sleep Hygiene Index. *Journal of Behavioral Medicine, 29*(3), 223-227. https://doi.org/10.1007/s10865-006-9047-6

Morin, C. M., Belleville, G., Belanger, L., & Ivers, H. (2011). The Insomnia Severity Index: Psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep, 34*(5), 601-608. https://doi.org/10.1093/sleep/34.5.601

Okano, K., Kaczmarzyk, J. R., Dave, N., Gabrieli, J. D. E., & Grossman, J. C. (2019). Sleep quality, duration, and

consistency are associated with better academic performance in college students. *NPJ Science of Learning, 4*, 16. https://doi.org/10.1038/s41539-019-0055-z

Paine, S. J., Gander, P. H., Harris, R. B., & Reid, P. (2005). Prevalence and consequences of insomnia in New Zealand: Disparities between Maori and non-Maori. *Australian and New Zealand Journal of Public Health, 29*(1), 22-28. https://doi.org/10.1111/j.1467-842X.2005.tb00743.x

Sopoaga, F., Zaharic, T., Kokaua, J., Ekeroma, A. J., Murray, G., & van der Meer, J. (2013). Pacific students undertaking the first year of health sciences at the University of Otago, and factors associated with academic performance. *New Zealand Medical Journal, 126*(1384), 96-108.

Stats NZ. (2018a). Dunedin City. Retrieved from https://www.stats.govt.nz/tools/2018-census-place-summaries/dunedin-city#ethnicity-culture-and-identity

Stats NZ. (2018b). Pacific Peoples ethnic group. Retrieved from https://www.stats.govt.nz/tools/2018-census-ethnic-group-summaries/pacific-peoples

Strayhorn, T. L. (2011). Bridging the pipeline: Increasing underrepresented students' preparation for college through a summer bridge program. *American Behavioral Scientist, 55*(2), 142-159. https://doi.org/10.1177/0002764210381871

Time, W. S., Samalia, L., & Wibowo, E. (2023). Anatomical sciences education needs to promote academic excellence of ethnic minority students-Evidence from Pasifika students at the University of Otago. *Anatomical Sciences Education, 16*(6), 1011-1023. https://doi.org/10.1002/ase.2319

University of Otago. (2023). Quick statistics. Retrieved from https://www.otago.ac.nz/about/quickstats.html

World Health Organization. (2021). *07 Insomnia disorders.* https://icd.who.int/browse11/l-m/en#/http://id.who.int/icd/entity/1038292737.

Yamada, Y., Klugar, M., Ivanova, K., & Oborna, I. (2014). Psychological distress and academic self-perception among international medical students: The role of peer social support. *BMC Medical Education, 14*, 256. https://doi.org/10.1186/s12909-014-0256-3

Corresponding Author
Dr. Erik Wibowo.
Department of Anatomy, University of Otago, Dunedin
Phone: +64 03 470 4692.
Email: erik.wibowo@otago.ac.nz
ORCID: 0000-0002-5309-1490

Funding: IF was supported by a Summer Research Scholarship from the Division of Health Sciences. During the recruitment phase, IF was supported by a grant from the Rule Foundation to EW. The research was funded by the Accelerator Grant from the Division of Health Sciences to EW.

Acknowledgement: We thank John Johnston from the Biomedical Otago Pasifika Students Association, and Sonya Xavier from the Pacific team of the Division of Sciences for their help in distributing our survey during the recruitment phase. We thank Joanna Mainwaring for editorial input.

Author Contributions
Conceptualization : IF, LS, EW. **Data curation :** EW. **Formal analysis :** IF, EW**. Funding acquisition :** IF, LS, EW**. Investigation :** IF, LS, EW**. Methodology :** IF, LS, EW**. Project administration :** IF, EW**. Resources :** EW. **Software :** N/A. **Supervision :** LS, EW**. Validation :** N/A. **Visualization :** N/A. **Writing — original draft :** LS, EW. **Writing —** IF, LS, EW**.**