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Extraversion, Neuroticism, and Academic Burnout in Malaysian University Students: A Mediation Analysis

Extraversión, neuroticismo y agotamiento académico en estudiantes universitarios de Malasia: un análisis de mediación

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Abstract

Academic burnout is common with university students however, the exploration between personality traits and burnout remains limited in the Malaysian context. This study explored the relationship between extraversion, neuroticism, and academic burnout in university students in Malaysia, mediated by depression. 64 university students from the University of Nottingham Malaysia (83% F; mean age = 21.2 ± 1.75 years) completed multiple validated questionnaires assessing personality traits (Big Five Inventory), academic burnout (Oldenburg Burnout Inventory-Student Survey) and psychological well-being (General Well-Being Scale). Pearsons and Bayesian correlations examined correlational relationships whereas mediation analyses with bias-corrected bootstrapping (1,000 iterations, 95% CI) tested indirect effects. The analyses revealed that greater extraversion correlated with lower neuroticism and lower academic burnout, whereas higher neuroticism predicted increased burnout. Two mediation models found that depression mediated the association between neuroticism and academic burnout while extraversion did not. Our findings indicate depression as a link between neuroticism and academic burnout in Malaysian university students. Universities should prioritise emotion regulation interventions and emotional intelligence workshops for students with high neuroticism, to effectively prevent academic burnout.

Keywords: burnout, students, extraversion, neuroticism, well-being.

Resumen

El agotamiento académico es común entre los estudiantes universitarios; sin embargo, la exploración de la relación entre los rasgos de personalidad y el agotamiento sigue siendo limitada en el contexto malasio. Este estudio exploró la relación entre la extraversión, el neuroticismo y el agotamiento académico en estudiantes universitarios de Malasia, mediada por la depresión. Sesenta y cuatro estudiantes universitarios de la Universidad de Nottingham Malasia (83% mujeres; edad media = 21.2 ± 1.75 años) completaron varios cuestionarios validados que evaluaban los rasgos de personalidad (Inventario de los Cinco Grandes), el agotamiento académico (Encuesta de Estudiantes del Inventario de Agotamiento de Oldenburg) y el bienestar psicológico (Escala de Bienestar General). Se realizaron correlaciones de Pearson y bayesianas para examinar las relaciones correlacionales, mientras que los análisis de mediación con bootstrapping corregido por sesgo (1,000 iteraciones, IC del 95%) evaluaron los efectos indirectos. Los análisis revelaron que una mayor extraversión se correlacionó con un menor neuroticismo y un menor agotamiento académico, mientras que un mayor neuroticismo predijo un aumento del agotamiento. Dos modelos de mediación mostraron que la depresión medió la asociación entre el neuroticismo y el agotamiento académico, mientras que la extraversión no lo hizo. Nuestros hallazgos indican que la depresión actúa como un vínculo entre el neuroticismo y el agotamiento académico en los estudiantes universitarios malasios. Las universidades deberían priorizar intervenciones de regulación emocional y talleres de inteligencia emocional para los estudiantes con alto nivel de neuroticismo, a fin de prevenir eficazmente el agotamiento académico.

Palabras clave: agotamiento académico, estudiantes, extraversión, neuroticismo, bienestar.

INTRODUCTION

Personality traits are unique characteristics consisting of an individual's thinking, feelings and behaviours that remain relatively stable throughout their lifetime (Diener & Lucas, 2016). Historically, personality traits have been narrowed down over time, and are now measured on five popular dimensions which are Extraversion, Openness to experience, Neuroticism, Agreeableness, and Conscientiousness, commonly known as the Five-Factor Model (FFM) or OCEAN (Costa & McCrae, 1999). The present study is focused on extraversion and neuroticism, and their association with psychological well-being and academic burnout in young adults studying at universities in Malaysia.

Psychological well-being can be simplistically defined as the mental state of an individual, where positive well-being indicates a mentally healthy and balanced individual (Robertson, 2018) while anxiety and depression can be conceptualised as signs of poor well-being. On a more complex level, psychological well-being comprises an individual's capacity to derive joy and significance from life experiences, be resilient throughout life's challenges and able to contribute to society, and maintain a healthy mental state (Tang et al., 2019; World Health Organisation, 2022). Based on Costa and McCrae's model (1999), individuals with high levels of extraversion enjoy companionship and thrive in social situations, which leads to an abundance of friendships, an outgoing personality, and exceptional social skills. Conversely, individuals with high levels of neuroticism are described to constantly experience a sense of depression, hopelessness, and guilt, leading to a lack of confidence and pessimistic attitudes (Costa & McCrae, 1999). Individuals who can sustain a state of contentment and fulfilment (i.e., those with high extraversion and low neuroticism) are likely to experience minimal depressive and anxiety symptoms, cultivate a healthy level of self-esteem, as well as build meaningful connections in life (Pukhraj, 2021). In return, these individuals would experience positive psychological well-being as well as healthy inter- and intra- personal relationships (Pukhraj, 2021).

Extraversion and neuroticism have been found associated with psychological well-being. Uliaszek et al. (2010) found low levels of extraversion significantly related to social anxiety, and high levels of neuroticism significantly associated with depression and interpersonal stress (this was also corroborated by other studies conducted in Asia, see for example, Gao et al., 2017). Additionally, Kokko et al. (2015) found the combination of low levels of extraversion and high levels of neuroticism related to poorer psychological well-being, with high neuroticism being also associated with reduced life satisfaction (Malvaso & Kang, 2022). Moreover, research by Gale et al. (2013) demonstrated how extraversion assessed at a young age (16-26 years old) may positively contribute to psychological well-being at a later age (60-64 years old). On the contrary, those with higher neuroticism at a younger age are likely to experience lower life satisfaction, poorer physical health and increased psychological distress at older age (Etxeberria et al., 2019). Such evidence not only suggests that high extraversion and low neuroticism are cross-sectionally associated with general well-being, but also that this particular combination of personality traits may predict emotional and physical health outcomes at later ages. The first aim of our research was, therefore, to investigate the association between extraversion and neuroticism, and psychological well-being in university students in Malaysia. We focussed on university students because of the widely reported association between high neuroticism and poor psychological well-being reported in this population (see Liu et al., 2019, for a systematic review), which however has not been fully verified in Malaysian samples. Considering our focus on university students, we deemed it appropriate and relevant to incorporate academic burnout as a possible contributing factor to psychological well-being, besides extraversion and neuroticism.

Academic burnout is described as the set of feelings of emotional burnout, detachment, diminished sense of personal accomplishment associated with a lack of interest in academic activities and psychological distress (Chen et al. 2021; Chen et al., 2022; Zhang et al., 2021). A recent study by Yusoff et al. (2021) on medical students in Malaysia demonstrated a significant indirect relationship between high neuroticism, high academic burnout, and psychological distress. Specifically, it has been proposed that neuroticism may lead to academic burnout and poor academic performance due to fluctuations in emotional moods (Begum et al., 2021).

Importantly, extraversion has been proposed to be a protective factor for academic burnout (Soliemanifar & Shaabani, 2013), considering that more extraverted individuals are more likely to have better resilience when progressing through their academic journey, especially during those years that are more challenging (Celik & Oral, 2013). Helping young people (especially those who are less extroverted and more neurotic) to improve resilience is likely to benefit a large number of university students. For example, there are encouraging results from a study recently conducted in Malaysia to test the effectiveness of a 6-week breathing-based mindfulness program for university students with high neuroticism (Izhar et al., 2022). The intervention, in fact, led to a reduction in students' anxiety and stress, even if it was low-intensity and relatively short.

However, the literature on the association between extraversion and neuroticism, academic burnout and psychological well-being in students from Malaysia or other South-East Asian countries, is scarce and not fully consistent. Thuruthel & Tungol (2021), for example, found a negative correlation between academic burnout and psychological well-being among South Indian university students, but they collected their data during the COVID-19 pandemic and relative lockdowns in India, which may have confounded the study findings. On the other hand, Tanveer and Kamran (2023) recently conducted a study to investigate the relationship between academic burnout, mindfulness, and psychological well-being among 200 tertiary Pakistani students. They did not find a clear association between burnout and psychological well-being, but they found that practising mindfulness was associated with increased psychological well-being (in line with Izhar et al., 2022).

In Malaysia, studies conducted on students enrolled in medicine or dentistry programmes (Bhagat et al., 2016; Yusof et al., 2016; Yusoff et al., 2013, 2021) showed that high neuroticism is significantly associated with psychological distress, potentially leading to higher academic burnout and poorer academic achievements. Importantly, emotional intelligence (which is likely to be associated with extraversion; see, for example, Ghiabi & Besharat, 2011), was a protective factor for academic burnout, with more extrovert medical students being less prone to experience academic burnout (Yusoff et al., 2021). Although these studies are very relevant to address our main research questions, they only involve students undergoing clinical or medical training with high academic and professional demands.

To address the gaps in Malaysian literature, this study aims to investigate the associations between extraversion, neuroticism, academic burnout and psychological well-being in non-medicine and dentistry university students in Malaysia. Confirming these associations has the potential to lead to the development and implementation of interventions and re-definition of university policies and regulations aimed at supporting university students (especially, those with low extraversion and high neuroticism) to develop resilience and identify coping strategies to overcome the challenges arising from their academic journey. This is likely to help them to achieve academic success and reduce the risk of dropping out from their courses or worsening of psychological well-being due to experiencing burnout during their time at university.

- **H1.** Higher Extroversion scores are correlated with reduced Neuroticism scores, reduced depressive traits, lower academic burnout, and increased positive well-being.

- **H2.** The associations between Extraversion and Academic Burnout, and between Neuroticism and Academic Burnout, are mediated by depressive traits.

- **H3.** The association between Neuroticism, Depression and Academic burnout is mediated by Extraversion scores.

METHODS

Transparency statement

Although this study was not pre-registered, the hypotheses were formulated prior to data analysis. This was ensured as part of the ethical approval process, during which the two co–first authors, both students, were required to specify the study hypotheses before data collection commenced. Ethical approval was obtained before the start of data collection. The data that support the findings of this study are available from the corresponding author upon request.

Sample characteristics, recruitment & ethical approval

The current report is based on data collected for two final year research projects undertaken as part of the BSc Psychology at the University of Nottingham Malaysia, in the academic year 2021-22. Ethical approval for both projects was granted by the University of Nottingham Malaysia Science and Engineering Research Ethics Committee (SEREC) (ref.: SRMB111121). Participants were recruited using opportunity sampling through e-posters posted on social media websites, as classes were conducted mostly online during the academic year 2021-22. While this approach was convenient for easy recruitment, it limits generalisability to the rest of the students in Malaysia. Stratified random sampling across universities, programs, and demographics should be utilised for future studies to enhance validity.

An a-priori power analysis conducted in G*power (Faul et al., 2007) showed that a minimum sample size of 61 participants would have been sufficient to identify a small-to-medium effect (r = 0.35, bivariate correlation analysis), with 80% power and 0.05 as the statistical significance threshold. Considering 10% attrition, we aimed at recruiting at least 67 participants for the study.

Inclusion criteria for participation to the study were: a) being between 18 and 25 years old; b) not being diagnosed with any form of psychological/ psychiatric disorders; c) a tertiary education student under any Malaysian institution. There were no restrictions in relation to nationality, but international students needed to reside on campus at the time of the study to be eligible for participation. Participants were not compensated for their participation, but Psychology students received formal credits through an established system within the School of Psychology at the University of Nottingham Malaysia.

Questionnaires

All questionnaires were administered in English, designed and presented to participants in Qualtrics (https://nottinghammy.qualtrics.com). These included (1) the Big Five Inventory (BFI) (John & Srivastava, 1999), (2) the Oldenburg Burnout Inventory - Student Survey (OLBI-SS) (Reis et al., 2015), and the General Well-Being Scale (GWBS) (Dupuy, 1977). As this was a correlational study focusing on all five variables, every participant was required to complete each of the three questionnaires altogether. Each of the three questionnaires took approximately five minutes to complete, resulting in the whole online study lasting around 15 to 20 minutes for completion. Participants had an unlimited amount of time to complete the questionnaires; however, it was recommended to them not to allocate more than 20 minutes for the completion of the questionnaires.

Big Five Inventory (BFI)

The Big Five Inventory (BFI) measured participants' Extraversion, Neuroticism, Openness to Experience, Conscientiousness, and Agreeableness (John et al., 2008; John et al., 1991; Benet-Martinez & John, 1998) (See Appendix A). The BFI contains 44 statements that participants need to rate on a 5-point Likert scale (from 'Disagree strongly' to 'Agree Strongly'). Srivastava et al., (2003) found a high reliability for the BFI scale (α = .82), with the reliability of each of the subscales scoring more than .79. Rammstedt & John (2007) found the BFI to carry a .78 convergent validity correlation for all its subscales and has a 71% stable variance, sharing 61% of its variance with the NEO Personality Inventory, Revised (NEO-PI-R) domain scales. Used within the Malaysian context, the survey shows high psychometric properties with a high internal consistency (Cronbach's α) between 0.60 to 0.80 (Ibrahim et al, 2024). The Malay version of the survey also has a high internal consistency ranging from 0.94 to 0.96 (Mudayat et al., 2022).

Oldenburg Burnout Inventory – Student Survey (OLBI-SS)

Academic burnout was evaluated through Reis et al.'s (2015) Oldenburg Burnout Inventory – Student Survey (OLBI-SS) which was revised from the original version of Demerouti et al.'s (2010) Oldenburg Burnout Inventory (OLBI). The original OLBI included items that were either framed positively or negatively and assessed two facets of academic burnout (i.e., exhaustion and disengagement) under a work context (Demerouti et al., 2010). It consisted of a total of 16 close-ended questions that needed to be indicated based on the extent of agreement by the participant via a 4-point Likert scale. Reis et al. (2015) then revised the OLBI to fit under an academic context by manipulating work-related keywords to academic related constructs and found that the OLBI-SS was able to equally replicate measures of academic burnout from the original OLBI that assessed work related burnout.

The OLBI-SS was shown to have partial factorial invariance that met prerequisites for assessing academic burnout levels in other countries (Reis et al., 2015) and thus was chosen as the appropriate scale due to the varying nationalities of participants recruited for this research. The total burnout scores can be calculated by summing up scores for all the items whereby higher scores indicated greater academic burnout (Demerouti et al., 2010). Future research should explore validating the English version of this survey within the Malaysian population; consider using the Malay-version of the survey which has a high internal consistency (Cronbach's α) ranging from 0.70 to 0.74 (Mahadi et al., 2018).

General Well-Being Scale (GWBS)

The 18-item General Well-Being Scale (GWBS) by Dupuy (1977) was used to measure participants' psychological well-being, distress, and inner state through 6 subsets: positive well-being, vitality, depression, anxiety, general health, and self-control. The questionnaire uses two rating scales whereby items 1 to 14 are measured using a 6-point Likert scale, while items 15 to 18 are measured using an 11-point Likert scale. The scale has an average correlation of .69 between the overall scale and its six independent subsets, with inter-subset correlations ranging from .65 to .90 (McDowell, 2009). Substantial test-retest reliability for this questionnaire after three months (.68 and .85) was also reported, which contributed to an overall internal consistency of .90 (McDowell, 2009). While the survey has been used in Malaysian studies (Naidu et al, 2024), future studies should formally validate the GWBS in Malaysian samples.

Procedure, Data Processing and Outcome Measures

Each participant was given a link to access and complete the online questionnaires, after signing the consent form. From the three questionnaires (BFI, OLBI-SS and GWBS), six outcome measures were extracted and analysed: (a) Extraversion and (b) Neuroticism (BFI), (c) Academic Burnout (OLBI-SS), (d) Anxiety, (e) Depression, and (f) Positive Well-being (GWBS).

Although this study only focused on extraversion and neuroticism, the BFI covers all five facets of personality. Participants completed all 44 items, but only certain items were used to obtain a measure of each participant's Extraversion and Neuroticism. Specifically, items 1, 6, 11, 16, 21, 26, 31, and 36 were used to compute the Extraversion scores, while items 4, 9, 14, 19, 24, 29, 34, and 39 were used to compute the Neuroticism scores. Both scores were calculated as the average of each set of items. A higher total score is interpreted as a participant showing a stronger personality trait (e.g., high extraversion or high neuroticism). The OLBI-SS comprises 16 items that, when summed up, provide an estimate of each participant's level of Academic Burnout. Higher scores indicate a greater extent of academic burnout. Considering we focused on both positive and negative facets of psychological well-being, we focused on three subsets of the GWBS: Anxiety (items 2, 5, 8, and 16), Depression (items 4, 12, and 18), and Positive Well-being (items 1, 6, and 11). Each outcome measure was calculated by subtracting 14 to the sum of each set of items (as instructed by the GWBS manual, (Dupuy, 1977).

Analysis Plan and Statistical Tests

A significance threshold of 0.05 was used for Pearson's correlation analyses, which – together with the Bayesian analyses described below – were conducted in JASP (JASP Team, 2020). Participants' data with incomplete responses were discarded from the final dataset. We initially aimed to conduct Pearson's and Bayesian correlation analyses to investigate the association between the different outcome variables. First, we conducted Shapiro-Wilk tests and confirmed that all variables were normally distributed (all $W > 0.96$, all $p > 0.05$). We also performed Bayesian correlations, as they provide a more rigorous evaluation of the evidence in favour of the alternative hypothesis (H1) over the null (H0), overcoming the flaws of traditional Pearson's correlation analysis and the categorical discrimination between statistically significant and non-significant results based on p values (Cleophas & Zwinderman, 2018). We therefore used BF10 to evaluate the strength of the evidence (i.e., the effect size) in favour of the null vs. the alternative hypothesis. The rule of thumb (see, for example, Nuzzo, 2017), is that:

- $BF_{10} = 1$: equal evidence in support of the null and the alternative hypotheses

- $BF_{10} > 3$ or < 0.33: moderate evidence in support of, respectively, the alternative hypothesis and the null hypothesis (e.g., $BF_{10} = 3$ indicates that there is three times more evidence in support of H_1 vs H_0). Evidence is considered stronger when $BF_{10} > 10$ (in favour of H_1) or < 0.01 (in favour of H_0).

- BF_{10} between 0.33 and 3: anecdotal or unreliable evidence (either in support of H_1 or H_0)

Based on the results of the correlation analyses (presented in "Results"), we tested two mediation models (Mac Kinnon et al, 2007). to investigate if Depression mediated the associations between Extraversion and Academic Burnout, and between Neuroticism and Academic Burnout (Model 1), and if Extraversion somehow reduced the effect of Neuroticism or Depression on Academic Burnout (Model 2). Specifically, for Model 1, we tested the direct effect of Extraversion and Neuroticism on Academic Burnout (path c'), the indirect effect of Extraversion and Neuroticism on Depression (path a) and the indirect effect of Depression on Academic Burnout (path b). For Model 2, we tested the direct effect of Neuroticism and Depression on Academic Burnout (path c'), the indirect effect of Neuroticism and Depression on Extraversion (path a) and the indirect effect of Extraversion on Academic Burnout (path b). Confidence intervals (95%) were calculated using bias-corrected 1,000 bootstrap resampling. This exploratory analysis was carried out in JASP (JASP Team, 2020).

RESULTS

The descriptive statistics analysis can be found in Table 1 under Appendix A that highlights the mean, standard deviations and the 95% confidence intervals for each of the variables explored in this study.

Out of 68 participants who were recruited for the study, 64 participants (83% F; mean age = 21.2 ± 1.75 years) were included in the final dataset (four participants were excluded due to missing data). The participants were primarily composed of 78% of Malaysian individuals (N = 50) and 22% of non-Malaysian students (N = 14).

Our first set of analyses assessed if there were any statistically significant correlations between the main outcome variables: Extraversion, Neuroticism, Academic Burnout, Anxiety, Depression, and Positive Well-being (refer to Table 2, Appendix B). We found evidence of moderate or strong correlations between different subscales of the same questionnaire. For example, we found statistically significant associations between higher Depression and higher Anxiety (r (62) = 0.47, $p < 0.001$, BF_{10} = 254.20, very strong evidence), higher Anxiety and reduced Positive Well-being (r (62) = -0.33, $p = 0.008$, BF_{10} = 4.75, moderate evidence), and higher Depression and reduced Positive Well-being (r (62) = -0.58, $p < 0.001$, BF_{10} = 35162.99, very strong evidence). We did find anecdotal evidence of a small and negative correlation between Extraversion and Neuroticism (r (62) = -0.30, $p = 0.02$, BF_{10} = 2.73, anecdotal evidence).

In relation to the association between personality traits, psychological well-being and academic burnout, we found that higher Extraversion and low Neuroticism were statistically significantly associated with lower Academic Burnout (Extraversion: r (62) = -0.39, $p = 0.001$, BF_{10} = 25.12, strong evidence; Neuroticism: r (62) = 0.55, $p < 0.001$, BF_{10} = 6250.27, very strong evidence). Higher Extraversion was statistically significantly associated with lower Depression (r (62) = -0.33, $p = 0.008$, BF_{10} = 4.82, moderate evidence). We did find anecdotal evidence of a very small positive correlation between Extraversion and more Positive Well-being (r (62) = 0.27, $p = 0.03$, BF_{10} = 1.50), and moderate evidence for the absence of a correlation between Extraversion and Anxiety (r (62) = 0.02, $p = 0.87$, BF_{10} = 0.16). In relation to Neuroticism, participants with higher scores on this personality trait were also characterised by significantly increased Depression (r (62) = 0.55, $p < 0.001$, BF_{10} = 8396.42, very strong evidence), reduced Positive Well-being (r (62) = -0.39, $p = 0.002$, BF_{10} = 20.95, strong evidence), but not Anxiety (r (62) = 0.16, $p = 0.21$, BF_{10} = 0.34, moderate evidence). While higher Depression was found statistically significantly associated with increased Academic Burnout (r (62) = 0.59, $p < 0.001$, BF_{10} = 67214.52, very strong evidence), Anxiety was not (r (62) = 0.17, $p = 0.19$, BF_{10} = 0.36, moderate evidence). Lastly, increased Positive Well-being was significantly associated with lower Academic Burnout (r (62) = -0.56, $p < 0.001$, BF_{10} = 15381.05, very strong evidence).

To summarise, we found clear evidence of associations between high Extraversion, low Neuroticism, low Depression, low Academic Burnout and increased Positive Well-being (with Neuroticism more clearly associated with lower Positive Well-being). We also found moderate evidence of absence of associations between Extraversion, Neuroticism and Anxiety (while this association was evident for Depression),

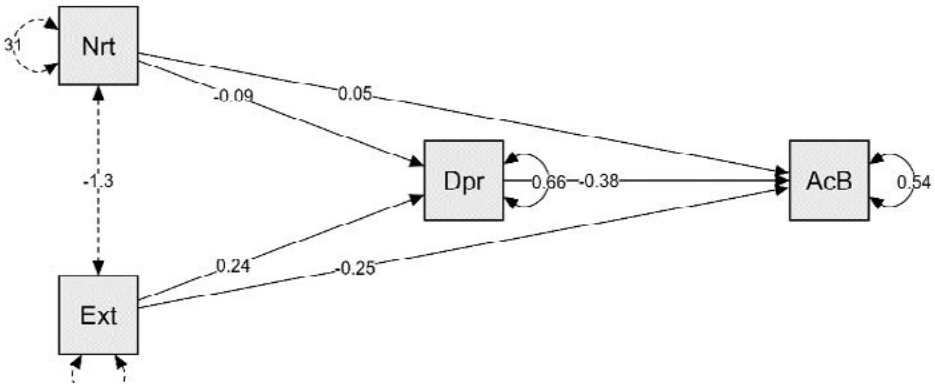
and between Anxiety and Academic Burnout (with Depression, on the other side, evidently contributing to increased Academic Burnout).

Based on these initial findings, we tested the validity of two mediation models to further understand the relationships between Extraversion, Neuroticism, Depression, and Academic burnout. As shown in Figure 1 (Model 1), the coefficients for the direct effect of Extraversion and Neuroticism on Academic Burnout (path c') were -0.246 (95% CI for 1000 bootstrapped samples = [-0.591; 0.122]) and 0.050 (95% CI = [-0.007; 0.093]), respectively, while the indirect effects were -0.088 for Extraversion (95% CI = [-0.240; 0.007]) and 0.033 for Neuroticism (95% CI = [0.011; 0.072]), indicating that the relationship between Neuroticism and Academic Burnout was mediated by Depression. More specifically, participants with higher Neuroticism showed higher traits of Depression, and this predicted increased Academic Burnout.

In relation to Model 2 (see Figure 2), the coefficients for the direct effect of Neuroticism and Depression on Academic Burnout (path c') were 0.050 (95% CI = [-0.007; 0.093]) and -0.099 (95% CI = [-0.187; -0.026]), respectively, while the indirect effects were 0.006 for Neuroticism (95% CI = [-0.004; 0.030]) and -0.011 for Depression (95% CI = [-0.058; 0.003]), indicating that Extraversion did not mediate the relationship between Neuroticism/Depression and Academic Burnout. Considering both models, it seems that Depression was the most important predictor of Academic Burnout, together with Neuroticism.

Figure 1

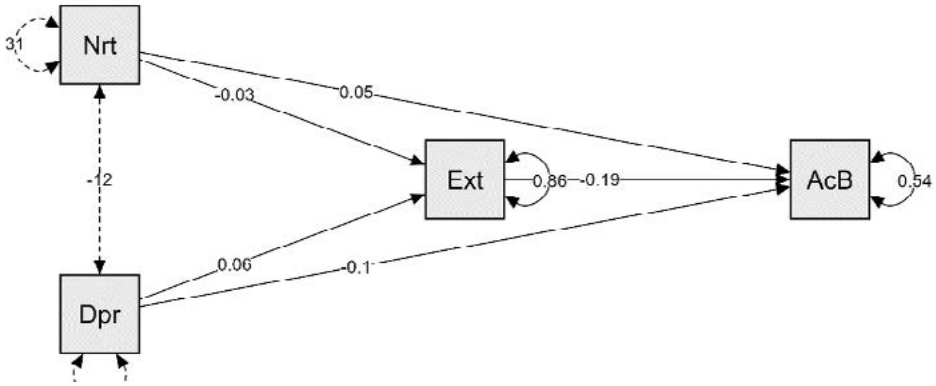
Model 1: mediated relationship between Extraversion/Neuroticism, Depression, and Academic Burnout (regression estimates are standardised).



Legend: AcB: Academic Burnout; Dpr: Depression; Ext: Extraversion; Nrt: Neuroticism.

Figure 2

Model 2: mediated relationship between Neuroticism/Depression, Extraversion, and Academic Burnout (regression estimates are standardised).



Legend: AcB: Academic Burnout; Dpr: Depression; Ext: Extraversion; Nrt: Neuroticism.

DISCUSSION

Our current research investigated the associations between extraversion, neuroticism, academic burnout, and psychological well-being (PWB), among university students in Malaysia. This study aims to support the limited research in this area in hopes of addressing the low mental health awareness in Malaysia, particularly for university students, and sparking more mental health initiatives in supporting this vulnerable generation.

In line with our primary hypotheses, we found that greater levels of Extraversion were associated with lower Neuroticism, lower depression, lower academic burnout, and generally increased positive well-being. Conversely, higher levels of neuroticism were correlated with an increase of all the above-mentioned traits. Importantly, we found evidence of negative effects of combined high Neuroticism and high depression, since this particular combination predicted higher levels of academic burnout, possibly leading to an overall decline in positive well-being and quality of life, with important implications on different domains of everyday life, including academic performance and social relationships.

We also found evidence of extraversion acting as a protective factor for psychological distress, depression and academic burnout, in line with existing literature (e.g., Hamad et al., 2020), despite extraversion not mediating the association between neuroticism or depression, and academic burnout. However, our findings are in line with recent research by Yu and Hu (2022) showing that not only does extraversion directly predicted lower depressive symptoms in college freshmen, but neuroticism as a trait positively predicted depression, thus decreasing the prospect of emotional well-being and life satisfaction (Kokko et al., 2015).

Although the direct mechanisms underlying the association between Extraversion/Neuroticism and psychological well-being are difficult to be ascertained, highly extroverted individuals have the ability to cognitively restructure their mindset when faced with challenging situations by counteracting negative thought patterns with positive ones, building resilience and making them better prepared when facing challenges (Connor-Smith & Flachsbart, 2007 ; Lu et al., 2014). Greater extraversion is indeed highly correlated to proactive resilience (the act of preemptively preparing for potentially challenging situations) and lower academic stress, as opposed to greater neuroticism, which is linked to lower proactive resilience (de la Fuente et el., 2021).

The role of other personality traits, such as Openness to Experience, Agreeableness, and Conscientiousness, should be considered when trying to understand the association between extraversion, neuroticism, academic burnout, and psychological well-being. A longitudinal study by Kokko et al. (2013) studied the association of all five personality traits with PWB among Finnish adults aged 33-50 years old. The study found that while Extraversion and Neuroticism were strongly related to PWB, so did the remaining three personality traits, particularly conscientiousness (Kokko et al., 2013). De la Fuentes et al. (2021) also found personality traits like conscientiousness to be highly associated with proactive resilience (the ability to adapt and overcome challenging situations) and lower academic stress.

We tested two mediation models, based on our initial findings from Bayesian correlation analysis, and found that the association between neuroticism and academic burnout was mediated by depression, indicating that individuals with higher neuroticism demonstrated greater levels of depression that predicted higher academic burnout. A similar effect was found with Model 2, which highlighted depression as an important component in predicting academic burnout, alongside Neuroticism. Unlike mediation, moderation refers to when the magnitude of association between two variables could change according to the strength of the moderator (Hair et al., 2021). In brief, the individual level of extraversion directly moderates the strength of the relationship between levels of neuroticism and tendencies to show depressive symptoms (Yu & Hu, 2022). In our study, we found that extraversion did not mediate the association between neuroticism and academic burnout but should be investigated in future studies.

Valencia and Christian (2022) examined the relationship between neuroticism, emotional regulation (the capability to calmly control and change one's distressed thoughts, emotions, and expressions during a negative situation; Whelan, 2022), and academic stress with depression in 138 Indonesian medical students. Their findings revealed a significant association between high

traits of neuroticism, low emotional regulation, and high academic stress in developing depression in the students. Students with higher neuroticism may therefore face more emotional instability and stress which affects their ability to cope with life challenges, increasing the likelihood of developing depression and academic burnout (Carver & Connor-Smith, 2010 ; Valencia & Christian, 2022). Our findings – which are complemented by Valencia and Christian's (2022) – align with the Conservation of Resources (COR) theory (Hobfoll, 1989). The COR is a stress theory describing the human motivation to replenish resources (things valued by different individuals i.e., objects, states, conditions) used up while completing tasks in order to avoid stress. In Valencia and Christian's (2022) study, students with high neuroticism, while also struggling to regulate their emotions, are susceptible to academic stress and academic burnout due to the lack of resources in adapting and overcoming academic challenges. This results in the dysregulation of emotions, thought clarity, and coping mechanisms, which probably led to depression in medical students (Valencia & Christian, 2022).

Our study can provide guidance about how to better support universities in restructuring their mental health initiatives for students. With 11% of young adults (aged 18 to 25 years old) reporting suicidal ideations, and a fraction of those young adults experiencing non-suicidal injuries (Casey et al. 2022), our findings highlight the importance for higher education institutions to adjust and tailor the mental health support they provide to students. Rather than just providing a one-size-fits-all solution (e.g., counselling), diverse methods/interventions need to be trialled and combined to cater to the diverse needs and capabilities of their students. Universities should consider introducing mental health modules and awareness programs regarding cognitive restructuring, proactive resilience, emotion regulation, and coping skills and mechanisms, which could be easily adopted and practised by students, with the aim of building resilience and adaptive coping strategies.

Our study has several limitations. Firstly, our sample size was relatively small, with only 64 university students in total from the same university and a predominantly female sample. This could pose a risk of increasing the chances of making clinical decisions that would yield false positive evidence (Faber & Fonseca, 2014). Future research should utilise stratified random sampling across all public universities, programs, and degrees for a comprehensive Malaysian study. Subsequently, participants were only assessed using self-reported measures through the online administered questionnaires, potentially resulting in response biases. There were also no forms of objective measurements via diagnostic instruments used to monitor physiological responses during the onset of the questionnaires that could act as an extraneous variable. Thirdly, the lengthy online questionnaires could have induced fatigue, eye strains, and lack of attention while completing the questionnaires which would have impacted the participant's responses. Therefore, future studies should consider assessing the participants' moods before introducing the lengthy questionnaires to account for their emotional state and rule out any of these factors. Finally, this research did not broadly focus on all five of the personality traits as it only emphasised extraversion and neuroticism, thus a holistic approach to incorporate all five of the traits with academic burnout and psychological well-being could not be studied.

In conclusion, our study contributes insights into the relationships between personality traits, academic burnout, and PWB among university students in Malaysia. Administering questionnaires in person under standardised conditions and possibly factoring in other personality traits like Conscientiousness could address limitations encountered in this research, which nevertheless has lighted the way for targeted mental health interventions to encourage psychological resilience and the development of coping strategies in students, to ultimately foster supportive and positive educational environments.

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Appendix A

Table 1

Descriptive Statistics for each of the variables

Variable	Mean	Standard Deviation	Lower 95% CI	Upper 95% CI
Extraversion	3.00	0.76	2.80	3.20
Neuroticism	22.44	5.63	21.06	23.81
Academic Burnout	40.41	8.35	38.34	42.31
Anxiety	16.78	2.45	16.17	17.41
Depression	14.31	3.81	13.42	15.24
Positive Wellbeing	10.48	3.03	9.75	11.23

Appendix B

Table 2

Pearson's and Bayesian Pearson Correlation Values

Variables		Extra	Neuro	A.Burn	Anx	Dep	P.Well
Extra	Pearson's r	-	-	-	-	-	-
	p value	-	-	-	-	-	-
	BF 10	-	-	-	-	-	-
	Upper 95% CI	-	-	-	-	-	-
	Lower 95% CI	-	-	-	-	-	-
Neuro	Pearson's r	-0.30*	-	-	-	-	-
	p value	0.02	-	-	-	-	-
	BF 10	2.73	-	-	-	-	-
	Upper 95% CI	-0.06	-	-	-	-	-
	Lower 95% CI	-0.50	-	-	-	-	-
A.Burn	Pearson's r	-0.39*	0.55***	-	-	-	-
	p value	0.001	<.001	-	-	-	-
	BF 10	25.12	6250.27	-	-	-	-
	Upper 95% CI	-0.16	0.69	-	-	-	-
	Lower 95% CI	-0.57	0.34	-	-	-	-
Anx	Pearson's r	-0.02	-0.16	-0.17	-	-	-
	p value	0.87	0.21	0.19	-	-	-
	BF 10	0.16	0.34	0.36	-	-	-
	Upper 95% CI	0.22	0.09	0.08	-	-	-
	Lower 95% CI	-0.26	-0.38	-0.39	-	-	-
Dep	Pearson's r	0.33	-0.55***	-0.59***	0.47***	-	-
	p value	0.008	<.001	<.001	<.001	-	-
	BF 10	4.82	8396.42	67214.52	254.20	-	-
	Upper 95% CI	0.52	-0.34	-0.39	0.63	-	-
	Lower 95% CI	0.09	-0.69	-0.72	0.24	-	-
P.Well	Pearson'r	-0.27	0.39*	0.56***	-0.33	-0.58***	-
	p value	0.03	0.002	<.001	0.008	<.001	-
	BF 10	1.50	20.95	15381.05	4.75	35162.99	-
	Upper 95% CI	-0.02	0.57	0.70	-0.09	-0.38	-
	Lower 95% CI	-0.47	0.15	0.36	-0.52	-0.72	-

Note. [*p < .05, **p < .01, ***p < .001] represent p-values for Pearson's Correlations.
Note. [*BF10 > 10, **BF10 > 30, *** BF10 > 100] represent Bayesian Correlations.