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The longitudinal study on the reciprocal effects between GPA and burnout in university students: exploring grit, self-efficacy, and resilience as moderators

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The current work aims to extend our understanding of the relationship between academic performance and burnout. Using longitudinal data collected from 521 students enrolled in a Singapore-based university from their freshmen year up to the end of year two, we examined the temporal order of the GPA-burnout relation to determine if there is a reciprocal relation between students' burnout and academic performance. Grit, grit-passion, grit-perseverance, self-efficacy, and resilience were tested as moderating factors that were thought to potentially exacerbate, or protect against, the negative effects between GPA and burnout. Employing a panel analysis by means of SEM revealed that the relationship between GPA and burnout in our data is one where higher GPA contributes to worse burnout. Of all the moderating factors, only grit-passion was found to moderate the relationship between GPA and burnout, indicating that this relationship also depended on whether one has high or low grit-passion. In practice, our findings imply that high-achieving students are at risk of experiencing burnout due to excessive pressure and constant striving for better performance, but cultivating passion and enjoyment for academic activities can serve as a protective factor against burnout.

KEYWORDS

burnout, academic performance, grit, longitudinal analysis, higher education

Introduction

Derived from the occupational burnout literature, *academic burnout* refers to the pernicious consequence of excessive and prolonged levels of academic-related stress, and is characterized by exhaustion from studying, cynicism towards one's studies, and a feeling of inadequacy related to academic work or accomplishment (Schaufeli et al., 2002; Salmela-Aro et al., 2009). These symptoms of burnout are associated with many negative outcomes for students, such as absenteeism, low self-esteem, poor motivation, and loss of interest and effort (Madigan and Curran, 2021). Due to the significant negative consequences associated with burnout and its impact on academic outcomes (Schaufeli et al., 2002; May et al., 2015; Madigan and Curran, 2021), there is a need for further research investigating the relationship between

burnout and academic performance. Such research can provide valuable insights into how to improve academic performance while mitigating burnout among students.

Burnout and academic performance

Burnout is consistently posited as a predictor of worse academic performance. In a recent meta-analysis of 29 studies, [Madigan and Curran \(2021\)](#) found that greater burnout in general, and worse burnout symptoms in all three areas of cynicism, exhaustion, and inadequacy, predicted worse academic performance. This same trend was observed across secondary and tertiary levels and across genders. [May et al. \(2015\)](#) analyzed university students' burnout and grade point average (GPA) over three semesters and found that burnout was associated with diminished academic performance.

However, [Madigan and Curran \(2021\)](#) highlighted that while most existing studies employed a cross-sectional design, there are far less studies that adopted longitudinal approaches. More longitudinal research on this relationship is necessary in order to extend our understanding of the relationship between academic performance and burnout (i.e., whether burnout predicts changes in academic performance over time or vice versa). This idea that previous performance can have an impact on students' later well-being has been established in the literature. Several studies found that students with lower GPA were more likely to experience higher levels of burnout ([Nikodijevic et al., 2012](#); [Ilić and Ilić, 2023](#)). For instance, [Nikodijevic et al.'s \(2012\)](#) study with medical students noted that GPA was one of the most predictive factors of burnout with those with lower GPA suffering significantly higher academic burnout. A greater understanding of the direction of effects, whether the GPA-burnout association is unidirectional or bidirectional, may put us in a better position to give suggestions for how we can improve academic performance while decreasing burnout.

[Paloş et al. \(2019\)](#) investigated the temporal order between students' grades and academic burnout by testing this relation in both possible directions: grades being influenced by students' burnout, and burnout levels being influenced by students' academic performance. [Paloş et al. \(2019\)](#) found that previous grades, specifically higher academic grades, predicted lower student burnout at a subsequent time point. They also showed that burnout had no significant influence on future grades. Although existing research typically report their findings in terms of the negative effects of burnout on students' academic performance, longitudinal findings such as these from [Paloş et al. \(2019\)](#) provide a different angle to envisage the relationship between burnout and academic performance—one that is potentially mutually reinforcing or reciprocal where students' academic grades can also influence the level of burnout students experience at a later time.

Moderators of GPA-burnout relationship

Besides the direct relationship between academic performance and burnout, the literature has put forth various moderating factors that could potentially exacerbate, or protect against, the negative effects between GPA and burnout. In this study, we focus on three such moderators: grit, self-efficacy, and resilience.

Grit

[Duckworth et al. \(2007\)](#) defined grit as embedded in two main facets: perseverance of effort (hereafter, perseverance) and consistency of interest (hereafter, passion). These two facets are distinct, yet are both thought to be significant contributors to academic success: perseverance is necessary as the process towards attaining success involves persistence through failures and hardship, and passion is required to make the commitment of deliberate practice for the many hours in the process. Individuals with greater levels of grit demonstrate passion and behave assiduously towards their goals; this passion coupled with their perseverance helps them overcome difficulties and obstacles along the way.

Previous studies have demonstrated grit's associations with constructs related to academics and well-being. Earlier studies by [Duckworth et al. \(2007\)](#) suggest that grit significantly predicts better outcomes in education, over and above IQ. As grit entails the ability to maintain both effort and interest in tasks that span a longer timeframe, grittier individuals were found having more advanced levels of education and higher undergraduate GPA compared to less gritty counterparts. More recently, [Fernández-Martín et al. \(2020\)](#) meta-analyzed the effects of grit on educational success and reported grit as a consistent positive predictor of GPA at various educational levels.

Grit has been posited as a protective factor in the relationships between burnout and well-being. [Jumat et al. \(2020\)](#) studied burnout in tertiary medical students in a longitudinal fashion where students were surveyed at quarterly intervals throughout their first year. Grit, not gender, social support, tolerance for ambiguity, or religiousness, was identified as a significant protective factor against later burnout. In other studies, grit has been found as a protective factor in the relationship between poor mental health and burnout ([Tang et al., 2021](#)). The two key components of grit, passion and resilience, work together to create a buffer against burnout. Passion, or a strong interest in one's field of study, fuels intrinsic motivation and a sense of purpose. This intrinsic motivation can act as a shield against the emotional exhaustion and cynicism that are hallmarks of burnout ([Rahmatpour et al., 2019](#); [Madigan and Curran, 2021](#)). Similarly, perseverance helps individuals maintain sustained effort and cope with setbacks and challenges, enabling them to navigate the stressors and demands that can lead to burnout ([Dam et al., 2019](#)).

Self-efficacy

Self-efficacy is referred to as one's evaluation of their capabilities to plan and implement the actions or behaviours required to achieve expected performance ([Bandura, 1977](#)). Self-efficacy beliefs have a significant impact on various aspects of academic performance, including task choice, effort, persistence, resilience, and achievement ([Bandura, 1977](#)). Students who feel more efficacious for learning are more inclined to actively participate in the development of their academic self-efficacy, invest greater effort, persevere longer in the face of challenges, and attain higher levels of academic success compared to those who doubt their capabilities ([Schunk and Pajares, 2002](#)).

For many decades now, researchers have posited self-efficacy beliefs as one of the most effective individual factors in explaining student burnout ([Maricuţoiu and Sulea, 2019](#); [Thuruthel and Tungol, 2021](#)) and in predicting academic performance ([Naderi et al., 2018](#); [Ersoy and Peker, 2020](#)). Individuals who are highly self-efficacious

could be thought to achieve better outcomes because of stronger beliefs in their ability and propensity to manage challenging situations more effectively. Research also found that students with higher levels of self-efficacy tend to choose challenging tasks, persevere in the face of difficulties, and adjust their learning strategies in response to failure, thus promoting academic success (Mega et al., 2014).

Therefore, it is unsurprising that self-efficacy has been found as a protective factor in the relationship between burnout and stress. Makara-Studzińska et al. (2019) showed that levels of emotional exhaustion, a core component of burnout symptoms, depends on one's sense of self-efficacy, irrespective of the level of stress at work; lower sense of self-efficacy evoked greater emotional exhaustion in both low- and high-perceived stress situations.

Resilience

Academic stress and exposure to prolonged levels of stress resulting in academic burnout contributes to poorer well-being and has a negative impact on academic performance of undergraduates (e.g., Ribeiro et al., 2018). Resilience is an important psychological characteristic that allows students to cope with and overcome the negative emotions, burnout, setbacks, and adversity associated with stress (Kang et al., 2019). In other words, resilience helps individuals to cope with stressful life events and to take proactive behavioral actions to facilitate coping (Folkman and Lazarus, 1985). Past literature has demonstrated that academic resilience, defined formally as "the heightened likelihood of success in school and other life accomplishments despite environmental adversities brought about by early traits, conditions, and experiences" (Wang et al., 1994, p. 46), is strongly associated with positive academic outcomes (Mwangi et al., 2015) and personal well-being amongst undergraduates (Stoffel and Cain, 2018).

Recent studies have also found that resilient students experienced a lower degree of academic burnout and better academic performance than less resilient students (Alsharif, 2020; Shin and Hwang, 2020). However, a study conducted on the effects of resilience on undergraduate students during the COVID-19 pandemic found that resilience only provided some protection against burnout, though the effects were inconsistent amongst the facets of burnout (Reed et al., 2022). Greater resilience was not related to lower levels of academic exhaustion after controlling for age, gender, and ethnicity. Given the limited, and sometimes mixed, findings about the resilience-burnout and resilience-GPA relationships, more research is needed to understand how resilience interacts in the relationship between academic performance and burnout.

In summary, the relationship between burnout and academic performance has been predominantly studied using cross-sectional designs with the relationship between burnout and academic performance consistently shown to be negative. While this has been summarized to reflect how greater burnout predicts worse academic outcomes, longitudinal studies have begun to shed light on the potential bidirectional nature of this relationship, suggesting that prior academic performance can also influence subsequent levels of burnout. Several studies indicate that higher academic performance may reduce future burnout, while lower grades increase the risk of burnout, highlighting the complex interplay between these variables.

Given this complexity, it is crucial to explore moderating factors that could mitigate or exacerbate the negative impact of academic performance on burnout. Grit, defined by Duckworth et al. (2007) as

comprising perseverance and passion, has been shown to significantly predict academic success and protect against burnout. Self-efficacy, the belief in one's capabilities to achieve desired outcomes, also plays a vital role in enhancing academic performance and reducing burnout by fostering resilience and persistence. Resilience, the ability to cope with and overcome stress and adversity, further contributes to better academic outcomes and lower burnout levels, although findings on its effectiveness have been mixed. Therefore, this study focuses on grit, self-efficacy, and resilience as potential moderators in the GPA-burnout relationship to provide a deeper understanding of how these factors can influence students' academic experiences.

Present study

The current study aims to examine a cross-lagged reciprocal effect model of the relation between GPA and burnout. This study extends the work of Paloş et al. (2019), the first study to investigate the temporal reciprocal relations between academic performance and burnout. Paloş et al. (2019) acknowledged that the structure of their sample, where more than half of their sample were females, the use of students from one specific discipline, and a small sample size of 142 students, were potential limitations one needed to consider alongside their findings. To address these limitations, the current study investigates the temporal order of the GPA-burnout relationship and the moderation effects of grit, self-efficacy, and resilience, using data from a cohort of undergraduate students from various academic clusters over three time points to give a more complete picture of the GPA-burnout relationship in students.

At present, the literature on grit, self-efficacy, resilience, and burnout in students is primarily dominated by studies that sampled students from the medical disciplines (e.g., Alsharif, 2020; Jones et al., 2023). This is not surprising as medical students are known to be exposed to countless highly stressful and highly demanding situations throughout their clinical years. However, it is important to recognize that the repercussions of high burnout is detrimental to all students of various disciplines. Existing research, particularly in the field of teacher education, has examined the interplay between burnout, grit, self-efficacy, and resilience. Zhou (2022) discussed the challenges of burnout faced by teachers in demanding work environments, emphasizing the significance of grit and self-efficacy as crucial emotional and psychological factors in alleviating teacher burnout. Their review underscored the importance of understanding the role of grit and self-efficacy in mitigating the detrimental effects of burnout among educators, findings that align with those reported by Zheng et al. (2022). In addition to investigating the mechanisms contributing to burnout in teachers, it is equally important to explore how the constructs of resilience, grit, and self-efficacy impact both burnout and academic performance in students. By delving deeper into these areas, we can develop targeted strategies and interventions to promote positive academic outcomes and reduce burnout in educational settings.

To the best of our knowledge, apart from Paloş et al. (2019), no other studies have investigated the temporal direction of relations between academic performance and burnout. Therefore, although any conclusion about the association between performance and burnout is very much preliminary, since previous studies were largely conducted using cross-sectional designs, the findings of the current

study adds to the literature and provide a different angle to envisage the relationship between burnout and academic performance. As such, we take the exploratory route by asking the following research questions (RQ) instead of posing a hypothesis:

RQ 1: How does students' burnout relate to academic performance (i.e., GPA) over time?

RQ 2: To what extent does the relationship between students' burnout levels and GPA vary by students' grit?

RQ 3: To what extent does the relationship between students' burnout levels and GPA vary by students' self-efficacy?

RQ 4: To what extent does the relationship between students' burnout levels and GPA vary by students' resilience?

Method

Sample

The present study was conducted with data collected from a total of 521 students enrolled in a Singapore-based university. We analyzed burnout data from students over three time points (i.e., T1—beginning of freshmen year, T2—end of freshmen year, T3—end of second year) and obtained GPA scores at T2 and T3 for these 521 students. Only students with at least two burnout measurements across the three time points were considered for inclusion. In general, this ensures that the resulting data set had a smaller percentage of missing data and thus increases accuracy of missing data imputation. [Appendix A](#) provides more information about how missing data was handled in this study.

Ideally, to assess the moderating effects of grit, self-efficacy, and resilience on the GPA-burnout relationship, we would use its measurements at T2. However, due to the nature of data collection and survey distribution, grit and resilience were only surveyed at T1 and T3. As such, we analyzed grit and resilience as moderators using data from T1, and self-efficacy as a moderator with data from T2. Utilizing data at T1 allows for findings to be discussed from a predictive angle. [Table 1](#) details the demographic composition of the students in this study.

Procedure and measures

Ethical approval for data collection was sought and obtained from the Institutional Review Board, at the authors' institution (IRB: 20170053). As part of the orientation program in SIT, incoming freshmen were invited to complete the Freshmen Survey online, in exchange for a token of appreciation. Burnout, grit, self-efficacy, and resilience were some of the measures within the larger Freshmen Survey. At the end of every following academic year, students complete the End-of-year Survey. [Appendix B](#) contains the full survey instrument for each variable analyzed in the current study. Students' GPA at the end of freshmen and second year were retrieved from the university system. [Table 2](#) contains statistical information of all study variables.

TABLE 1 Demographic composition of sample (N = 521).

	Study sample	
	n	%
Gender		
Male	241	46
Female	280	54
Age at enrolment		
19–21	197	38
22–24	287	55
25–27	24	5
28–30	5	1
>31	8	2
Academic cluster		
Health and Social Sciences	147	28
Food, Chemical and Biotechnology	79	15
Engineering	117	22
Infocomm Technology	62	12
Business, Communication and Design	116	22
Ethnicity		
Chinese	430	83
Malay	41	8
Indian	34	7
Others	16	3
Previous academic qualification		
Polytechnic Diploma	444	85
GCE A-Level	70	13
Others	7	1

Burnout

The School Burnout Inventory (SBI) is a questionnaire developed by [Salmela-Aro et al. \(2009\)](#) measuring the amount of burnout experienced by students. The SBI is a nine-item questionnaire which measures the experience of burnout among students in three dimensions: exhaustion due to demands of university work (e.g., 'Felt so overwhelmed by the work related to your studies'), cynicism about the meaning of university (e.g., 'Felt a lack of study motivation and thought of giving up'), and inadequacy about oneself at university (e.g., 'Had feelings of inadequacy in my studies'). For each item, students responded on a 5-point Likert scale from 1 (*Strongly disagree*) to 5 (*Strongly agree*); higher scores indicated greater levels of burnout. The SBI has been validated and found as a suitable instrument for measuring burnout levels in various cultures and with university students ([Merino-Tejedor et al., 2015](#); [Hernesniemi et al., 2017](#)).

According to [Salmela-Aro et al. \(2009\)](#), the scale shows high internal consistency with Cronbach's alpha (α) of 0.88, as do the subscales of exhaustion (0.80), cynicism (0.80), and inadequacy (0.67).

TABLE 2 Descriptive statistics and correlations for study variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. EX T1	1.00															
2. EX T2	0.36***	1.00														
3. EX T3	0.28***	0.54***	1.00													
4. CYN T1	0.74***	0.16***	0.17***	1.00												
5. CYN T2	0.23***	0.49***	0.25***	0.29***	1.00											
6. CYN T3	0.26***	0.35***	0.61***	0.35***	0.51***	1.00										
7. INAD T1	0.72***	0.27***	0.24***	0.72***	0.31***	0.31***	1.00									
8. INAD T2	0.23***	0.60***	0.42***	0.22***	0.56***	0.41***	0.36***	1.00								
9. INAD T3	0.16*	0.42***	0.60***	0.17***	0.42***	0.60***	0.27***	0.64***	1.00							
10. PA	-0.37***	-0.16***	-0.15*	-0.43***	-0.18***	-0.27***	-0.46***	-0.15***	-0.15	1.00						
11. PER	0.03	0.00	-0.04	-0.09	-0.13*	-0.08	-0.12*	-0.08	-0.13	0.23***	1.00					
12. GRIT	-0.26***	-0.11	-0.12	-0.36***	-0.17***	-0.22***	-0.40***	-0.15***	-0.15	0.89***	0.62***	1.00				
13. SE	-0.12*	-0.29***	-0.25***	-0.09	-0.36***	-0.35***	-0.22***	-0.43***	-0.40***	0.04	0.23***	0.12*	1.00			
14. RES	-0.37***	-0.27***	-0.14***	-0.32*	-0.20***	-0.16***	-0.33***	-0.13***	-0.08	0.33***	0.31***	0.36***	0.16***	1.00		
15. GPA T2	-0.02	-0.21***	-0.05	0.00	-0.23***	-0.08	-0.05	-0.35***	-0.26***	-0.01	-0.01	-0.02	0.30***	0.02	1.00	
16. GPA T3	-0.09	-0.11	-0.03	-0.09	-0.16***	-0.15***	-0.09	-0.21***	-0.24***	0.03	0.00	0.03	0.19***	0.03	0.73***	1.00
Means	2.50	3.00	3.30	2.40	2.60	3.00	2.70	3.10	3.30	3.30	3.70	3.60	3.60	3.40	3.70	3.71
SD	0.92	0.72	0.84	1.00	0.82	0.98	1.00	0.85	0.96	0.84	0.65	0.64	0.65	0.63	0.58	0.55
Cronbach's α	0.82	0.73	0.77	0.85	0.79	0.85	0.61	0.62	0.73	0.82	0.73	0.83	0.85	0.74	-	-

EX T1, Exhaustion T1; EX T2, Exhaustion T2; EX T3, Exhaustion T3; CYN T1, Cynicism T1; CYN T2, Cynicism T2; CYN T3, Cynicism T3; INAD T1, Inadequacy T1; INAD T2, Inadequacy T2; INAD T3, Inadequacy T3; PA, Passion; PER, Perseverance; SE, Self-efficacy; RES, Resilience. * $p < 0.05$, ** $p < 0.01$.

Cronbach's α calculated for the present research at T1 was 0.91 for the entire scale, 0.82 for exhaustion, 0.85 for cynicism, and 0.61 for inadequacy. At T2, Cronbach's α was 0.85 for the total score, 0.73 for exhaustion, 0.79 for cynicism, and 0.62 for inadequacy. At T3, Cronbach's α was 0.89 for the total score, 0.77 for exhaustion, 0.85 for cynicism, and 0.73 for inadequacy.

Grit

Grit was measured using the eight-item Short Grit Scale (Grit-S; Duckworth and Quinn, 2009) at T1 and comprises two subscales: the Consistency of Interest dimension (i.e., passion) and the Perseverance of Effort dimension (i.e., perseverance). Examples of items used were 'I often set a goal but later choose to pursue a different one' and 'I finish whatever I begin' to represent each subscale, respectively. Items on the perseverance scale were positively worded and scored on a 5-point Likert scale from 1 (*Not like me at all*) to 5 (*Very much like me*). Items on the passion subscale were negatively worded and reverse-scored from 5 (*Not like me at all*) to 1 (*Very much like me*).

Although Duckworth et al. (2007) originally developed grit as a one factor model with their 12-item grit scale, due to poor psychometric properties, Duckworth and Quinn (2009) later developed a shorter 8-item grit scale and showed that grit is better conceptualized as a second-order construct underpinned by related yet distinct first-order constructs (passion and perseverance). Later studies reviewed in the meta-analysis by Credé et al. (2017) also consistently found that the perseverance component of grit related more strongly to academic outcomes, than the passion component or overall grit. The current study, therefore, proceeded conservatively to examine how grit as a second-order construct, and passion and perseverance as first-order constructs, related to the study outcomes.

Duckworth and Quinn (2009) reported satisfactory internal reliability for the Grit-S with Cronbach's α ranging from 0.73–0.83. However, a more recent meta-analysis of the Grit-S reported that the average Cronbach's α for the overall Grit-S and individual subscales to be between 0.68–0.73 (Rocha and Lenz, 2022). Meriac et al. (2015) further found acceptable internal consistency ($\alpha=0.75$) for the passion subscale, but questionable internal consistency ($\alpha=0.65$) for the perseverance subscale.

In the present study, one item (i.e., 'Setbacks do not discourage me') was dropped due to a low factor loading of 0.22. We followed the criteria that loadings of ± 0.32 are considered adequate, while loadings of ± 0.50 or higher are considered practically significant (Peterson, 2000). The removal of this item as a component of the perseverance subscale is supported by previous research which similarly found an extremely low factor loading for this item (Mullen and Crowe, 2018; Fosnacht et al., 2019). These authors reported acceptable Cronbach's α values following the removal of the problematic item. In our research, with the removal of this item, Cronbach's α was 0.77 for the entire scale, 0.82 for passion, and 0.73 for perseverance.

Self-efficacy

The Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich et al. (1991) is an integrated self-report instrument that consists of items forming various subscales assessing students' motivational orientations, use of different learning strategies, and meta-cognition in university. According to Pintrich et al. (1993), the MSLQ showed high internal consistency with Cronbach's α values with majority of subscales reporting reliability

above 0.70. The scale also demonstrated good predictive validity for future academic performance. In the current study, students' self-efficacy was measured with the five-item Self-Efficacy for Learning & Performance scale in the MSLQ (Pintrich et al., 1991) using a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). An example of an item used was 'I believe I will do well in my studies'. Cronbach's α estimate for the total score was satisfactory at 0.85 (Watkins, 2018).

Resilience

The Brief Resilience Scale (BRS; Smith et al., 2008) was used to assess students' ability to bounce back from stress and is comprised of six items rated on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The scale is comprised of three positively and three negatively worded items. After the negatively worded items were recoded, high scores indicated high psychological resilience. The BRS has demonstrated good internal consistency in previous studies, with Cronbach's α values ranging from 0.70 to 0.91 (Smith et al., 2008). An evaluation of the psychometric properties of the BRS by Liu and Lim (2022) endorsed the scale as a sufficiently valid instrument for measuring resilience among university students in an Asian population.

In the current study, all three positively worded items (see Appendix B) had to be dropped due to low factor loadings of <0.32 , according to Peterson (2000). With the removal of these items, Cronbach's α estimate for the total score was satisfactory and had increased from 0.74 to 0.82 (Watkins, 2018). Indeed, as research has demonstrated that reversed items can cause issues, such as lower factor loadings and lower internal consistency reliability (resulting from weak correlations with items on the reverse polarity) compared to straightforward items (Weijters et al., 2013), the items on the BRS in our study also succumbed to these problems. However, it is important to note that the validity of the instrument is "not a property of an instrument, but rather a property of scores that are obtained when one uses a particular assessment with a particular group of subjects, in a particular setting and under certain conditions" (Lim et al., 2009, p. 252). Therefore, the validation procedure used in the current study ensured the appropriateness, meaningfulness, and usefulness of the specific inferences made from the resilience test scores.

Academic performance

Students' end of year GPA was used as the proxy for academic performance. In theory, students' GPA scores could range from 0.00 to 5.00. In our data, GPA at end of freshmen year 1 (T2) ranged from 1.88 to 4.89; GPA at end of second year (T3) ranged from 1.59 to 4.85.

Data analysis

The present study conducted structural equation modelling (SEM) panel analyses to examine the structural model of the relationships among GPA and burnout over time. All statistical analyses were performed with R 4.1.1 and data supporting the findings of this study are available from the corresponding author upon request.

The main analysis of interest was investigating if burnout predicted students' later grades (Burnout T1 \rightarrow GPA T2; Burnout T2 \rightarrow GPA T3), and/or if students' grades predicted later burnout in their

first 2 years of university (GPA T2 → Burnout T3). Figure 1 presents the model that was developed and tested. Additionally, grit, self-efficacy, and resilience were assessed as moderators in the GPA-burnout relationship. Figure 2 shows the conceptual models used to test the moderated effects.

Model fit criteria

To assess model fit of the structural model developed, several model fit indexes were used with cut-off criteria based on the recommendations of Hu and Bentler (1999). Additionally, to correct for non-normality of our data, robust fit indices were used. To be considered an acceptable model, it is recommended that robust Comparative Fit Index (CFI) of the model should be greater than 0.90, robust Tucker-Lewis index (TLI) should also be greater than 0.90, robust root mean square error of approximation (RMSEA) should be less than 0.06, and standardized root mean residual (SRMR) should be less than 0.08. Though studies commonly report the chi-square statistic as an indicator of model fit, it has been shown to be highly sensitive to sample size and thus was not included as a model fit index.

Results

GPA-burnout model fit

An evaluation of the GPA-burnout model fit using cut-off values of various fit indexes produced a satisfactory model-data fit (Robust CFI=0.97; Robust TLI=0.94; Robust RMSEA=0.04; SRMR=0.05). Our results showed a statistically significant link between burnout at all three time points, and GPA at both time points. More importantly, in our attempt to explore whether burnout levels would influence students' academic performance later, and/or if current grades affected burnout levels later, it was revealed that the latter better represented the relationship between GPA and burnout. The relationship between GPA and burnout was as follows: GPA at T2 has a significant positive influence on burnout levels at T3 ($\beta=0.11, p=0.05$; see Figure 3). In

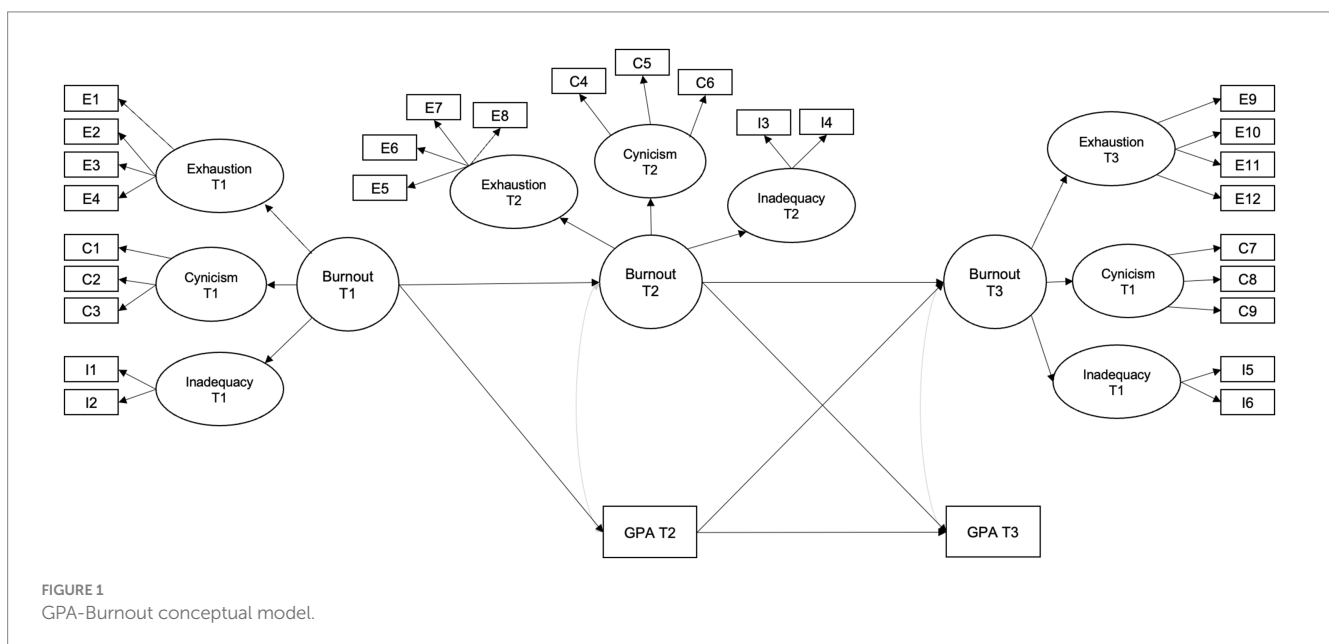
other words, students who were performing better in terms of their academic grades at the end of their freshmen year, subsequently experienced greater burnout at the end of their second year at the university.

Moderated effects of grit, self-efficacy, and resilience

An evaluation of the model with grit added as a moderator produced an acceptable model-data fit (Robust CFI=0.92; Robust TLI=0.90; Robust RMSEA=0.04; SRMR=0.06). However, perseverance was not found to be significantly related to grit in our data (see Figure 4); only passion was found as a significant component of grit. In other words, our results show that grit-passion was found as a significant moderator in the relationship between GPA and burnout ($\beta=-0.15, p=0.05$). This can be interpreted as the more passion an individual demonstrates, the more negative the relationship between GPA and burnout. Conversely, the less passion one demonstrates, the more positive the relationship between GPA and burnout. Finally, grit-passion at freshmen, on its own, did not significantly predict burnout levels at T3.

The standardized regression coefficient of passion loading onto overall grit exceeded one, which has been established by Deegan (1978) that “such coefficients can legitimately occur” (p. 887) and that researchers should not feel compelled to “modify models simply because of concern that the presence of multicollinearity may render offered models vulnerable to criticism” (p. 887). The implication of having a standardized regression coefficient greater than one in this case is not evidence of an improper solution but an indication that there may be over-factorization or over-parameterization in the second-order factor of grit. In light of this, our subsequent discussion will focus exclusively on the role of passion in the concept of grit in relation to burnout and academic performance.

An evaluation of the model with self-efficacy added as a moderator produced an acceptable model-data fit (Robust CFI=0.95; Robust



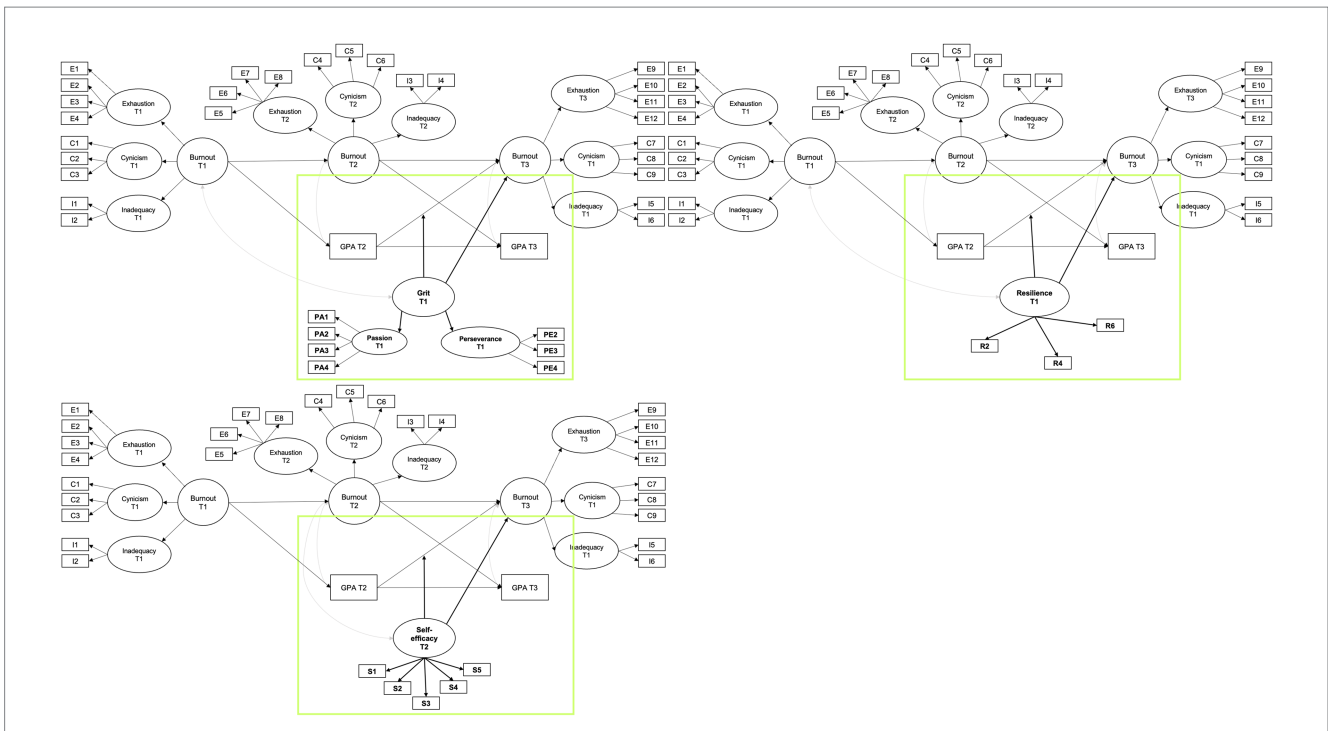


FIGURE 2 Conceptual models of Grit (top left), resilience (top right), and self-efficacy (bottom) as moderators in the GPA-burnout relationship.

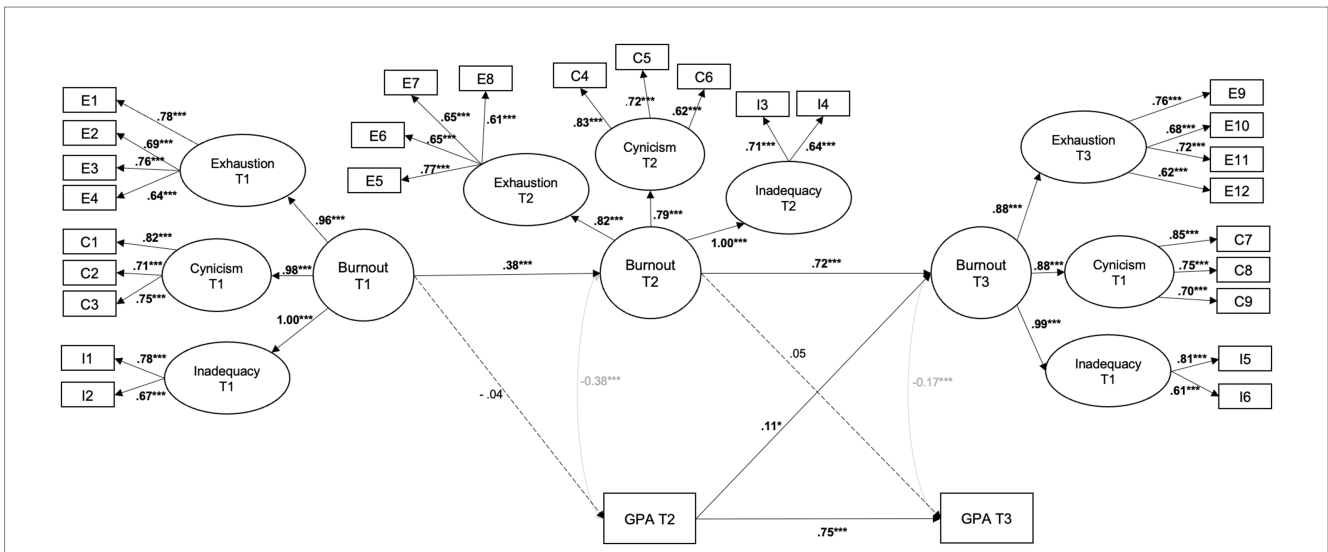


FIGURE 3 GPA-burnout model analysis. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$.

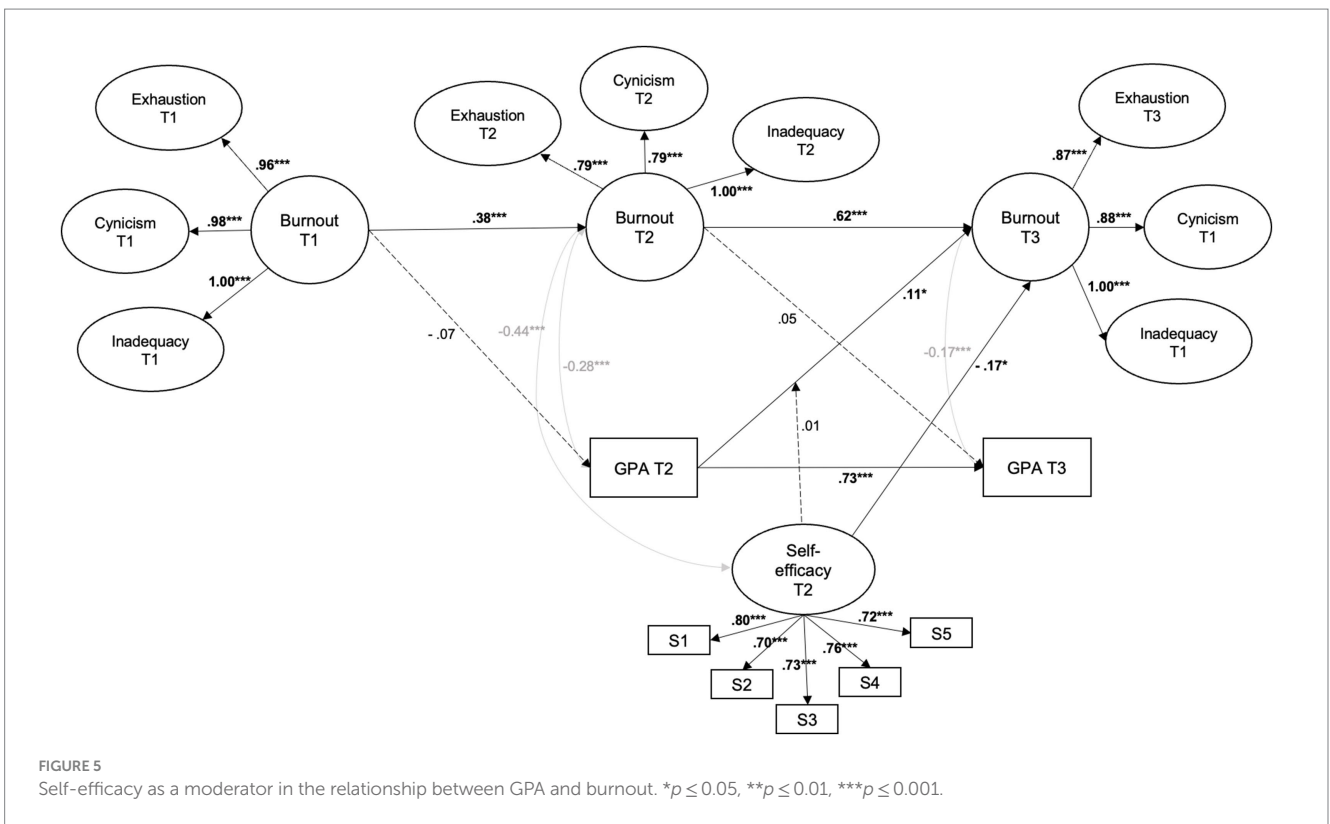
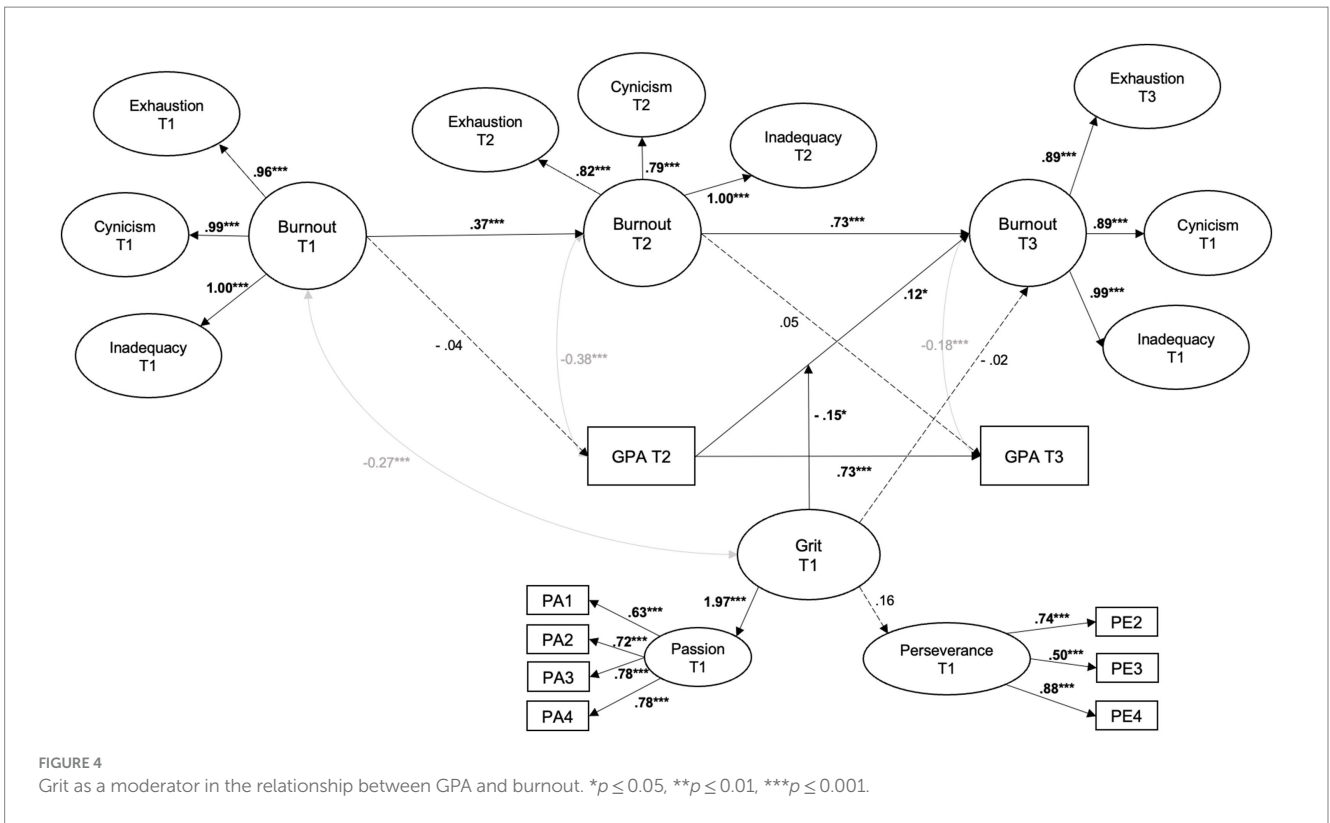
TLI=0.93; Robust RMSEA =0.04; SRMR=0.06). Self-efficacy at T2 was not a significant moderator in the relationship between GPA and burnout, however, self-efficacy at T2 significantly negatively predicted burnout at T3 ($\beta = -0.17, p = 0.05$, see Figure 5). In other words, students' with stronger beliefs in their capabilities to achieve greater academic success (i.e., higher self-efficacy) subsequently report lower burnout levels.

Finally, an evaluation of the model with resilience added as a moderator resulted in an acceptable model-data fit (Robust CFI = 0.91; Robust TLI = 0.90; Robust RMSEA = 0.04; SRMR = 0.06). In our data,

resilience at T1 was neither found as a significant moderator in the relationship between GPA and burnout, nor a significant predictor of burnout at T3 (see Figure 6).

Discussion

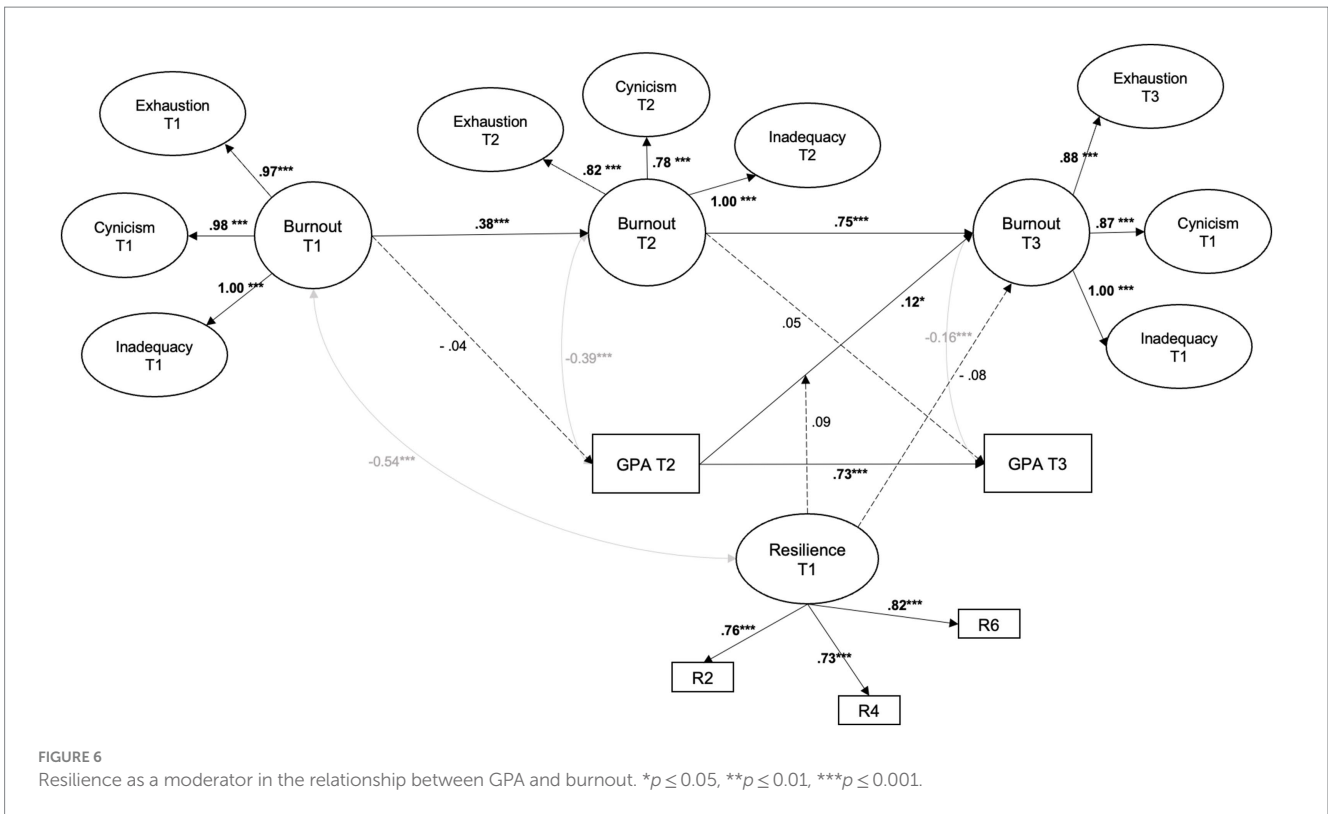
There is a consensus that learners' well-being and academic performance are two outcomes highly sought after in the learning and instructional process. Identifying barriers and protective factors



associated with realizing these outcomes is therefore imperative in education research. In the literature, it has been consistently reported that lower academic burnout is linked to better academic performance in students (Madigan and Curran, 2021). However, most existing

studies employ a cross-sectional design, while there are far less studies that adopt longitudinal designs.

The current research thus aims to fill this gap by using longitudinal student data to test two possible directions of the GPA-burnout



relationship: GPA being influenced by students’ burnout, and burnout levels being influenced by students’ GPA. This would help us understand how we may prevent, or at least reduce, academic burnout, and how to improve students’ overall academic performance. Additionally, we investigated the moderating effects of three factors: grit, self-efficacy, and resilience which are thought to potentially exacerbate, or protect against, the negative effects between the GPA-burnout relationship.

The central finding of the present study is that the relationship between GPA and burnout in our data is one where higher GPA relates to worse burnout in students. In other words, higher achieving students are at a greater risk of suffering from worse burnout over time. Interestingly, this contradicts previous findings by [Paloş et al. \(2019\)](#) who found better academic performance predicted future lower student burnout. Our findings add empirical support to [Paloş et al.’ \(2019\)](#) findings with regards to the temporal order of the GPA-burnout relationship (i.e., academic burnout levels as a consequence of GPA), however, further longitudinal research is necessary to ascertain the direction (i.e., positive or negative) of effect in the GPA-burnout relation.

Our finding is rather novel within the broader literature. Two studies (albeit cross-sectional) that have found similar results, reasoned that it is highly possible for one’s grades to predict worse burnout later (i.e., a positive correlation academic performance and burnout). [Kotzé and Kleynhans \(2013\)](#) revealed that the aspect of emotional exhaustion was significantly predictive of academic performance in undergraduate students; those who reported being highly emotionally exhausted performed better in their first year of university than other students. Furthermore, using path analysis on a group of undergraduates, [Friedman \(2014\)](#) reported a strong positive link between academic performance and overall student burnout.

Both studies reasoned that such findings may be seen in high achievers (or overachievers) who set very high standards for themselves. The pressure they put on themselves to maintain their grades, leads to constant striving towards improving one’s performance. These traits that characterize high achievers likely predisposes them to being exhausted and experiencing academic burnout. In fact, [Freudenberger \(1980\)](#), the first who postulated the concept and definition of burnout, stated that those with the personality of an overachiever were more prone to burnout. With both early and more recent research converging with findings in the present study, it may not be entirely unexpected to find an association between high academic performance and subsequent worse burnout.

Furthermore, we postulate that in addition to the expectations students put on themselves to improve their performance, a significant contributor of academic stress arises from external expectations. Additionally, significant others, such as one’s parents and teachers, may directly or indirectly indicate the high value they place on one’s academic achievement. These expectations are then internalized and incorporated into self-expectations to succeed, which in turn may translate to better performance ([Ma et al., 2018](#)). However, when students perceive that meeting those expectations from multiple sources would be challenging, they get overwhelmed and easily succumb to feelings of burnout. Indeed, high parental expectations have been expressed as a ‘double-edged sword’; on one hand, expectations can act as a motivator for students to achieve academic success, but have negative influences on students’ well-being ([Ma et al., 2018](#); [Kamanda et al., 2020](#)). Studies have found that students from an Asian society such as Singapore, are greatly influenced by others’ expectations of them. For example, [Ang et al. \(2009\)](#) compared between Canadian and Singaporean students and found cross-cultural differences in terms of academic stress arising from self and others’

expectations. Students from Singapore reported greater levels of academic stress compared to Canadian students, with a larger cross-cultural effect arising from stress due to others' expectations than self-expectations. Therefore, it is not surprising that students in our study experience stress from the expectations of others to achieve academic success, which in turn leads to worse burnout and poorer well-being.

Next, we found that grit-passion, specifically, negatively moderated the relationship between GPA and burnout. In other words, the relationship between GPA and burnout depends on whether one has high or low grit-passion. At higher levels of grit-passion, the better one's grades, the lower one's burnout levels. Conversely, having lesser grit-passion, the better one's grades, the higher one's burnout levels. All in all, this implies that the negative consequences of students' GPA on burnout are exacerbated when one demonstrates less passion. As this study is the first to test the protective or moderating effects of grit in the relationship between GPA on burnout, this finding is encouraging for future work in this area and has important implications for students and educators.

Interestingly, it was found that the passion facet only, represented the grit construct. Perseverance was not a significant component of grit in our data. Xu et al. (2020, p. 8) similarly reported that 'the measurement precision of Perseverance of Effort dimension is in need of further improvement'. This was evident in our data as one item was observed with extremely low item discrimination indices (factor loading) and had to be dropped; additionally, the poor reliability index ($\alpha=0.65$) revealed that the thresholds of three of four items on the scale had rather sparse covering in the lower range of the perseverance variable distribution, suggesting that measurement precision is likely inadequate for individuals with lower levels of perseverance (Xu et al., 2020).

However, we recognize that this is an atypical finding that is contrary to the meta-analytic review by Credé et al. (2017) comprising of multiple studies that demonstrate weak relations between grit-passion and academic achievement. Perseverance exhibited stronger associations with academic performance compared to passion or overall grit scores. We posit that the studies analyzed in Credé et al. (2017) focused on examining the role of grit in the U.S or in primarily Westernized cultures, and there is a scarcity of research conducted in Asian collectivist societies (e.g., Suzuki et al., 2015; Datu et al., 2016). Hence, we speculate that cultural differences could be one reason for why we found grit-passion as a key predictor. Future research should conduct further empirical studies to examine the role of grit in primarily collectivist settings.

Another plausible reason may be attributed to the fact that as more than 80% of students in our study already possessed a polytechnic diploma (similar to an associate's degree in the U.S.). In essence, the intention to pursue a bachelor's degree study could be motivated by students' interests in the subject matter or for career advancement, and thus we observed in this sample that passion was a key predictor over perseverance. Similar findings were reported by Palczyńska and Świst (2018) where they found passion not perseverance associated with higher education attainment. To this end, our study is but one that adds to evidence of the issues surrounding the construct of grit, warranting the necessity for improvements to the measurement of grit (Credé et al., 2017; Xu et al., 2020).

Both resilience and self-efficacy did not moderate the relationship between GPA and burnout; the effects of academic performance on burnout did not depend on whether one is more (or less) resilient or more (or less) self-efficacious. However, further research is necessary

before offering speculations or reasons for the null findings. Instead, we did find that students with stronger beliefs in their capabilities to achieve greater academic success (i.e., higher self-efficacy) report lower burnout later. This was expected as self-efficacy has been consistently shown to be a strong predictor of burnout in previous empirical work (Rahmati, 2015; Maricuțoiu and Sulea, 2019).

Practical implications

Our findings have practical implications for students and educators, as well as future research. Good grades are not typically associated with a cause for concern, however, our results suggest that we do have to pay close attention to those who are doing well academically as they are more likely to experience worse burnout later. These students may push themselves too hard and constantly seek to achieve or perform better, resulting in exhaustion and burnout. In practice, educators should be alert when they come across overachievers in their classes who check the boxes of being increasingly pessimistic and showing a lack of interest in their work (academic apathy), overly anxious and self-critical about assessments, or increasingly exhausted and disengaged in class activities. Nonetheless, our findings provide some consolation; instilling stronger grit-passion in high achieving students acts as a protective factor against the negative influence of high GPA on burnout. Given this, universities should guide students to realise the enjoyment for academic activities and rediscover the passion for the course they are taking, to facilitate a healthy negative GPA-burnout (i.e., high GPA, low burnout) relationship.

Our investigation into the possible temporal order of the GPA-burnout relation informs educators about the importance of identifying and being aware of students who are striving purely for better grades, not out of enthusiasm and enjoyment of what they do. Though particularly salient in Asian societies (Ang et al., 2009; Chyu and Chen, 2022), simply striving for grades may not be sustainable in the long run and may be at the expense of poorer well-being and worse burnout. Therefore, educators play a crucial role in helping students realise that though grades are important, the process or journey towards it can be made more enjoyable.

To foster a deeper engagement with learning, universities can promote a growth mindset, where effort and perseverance are valued over innate ability, encouraging students to embrace challenges and view setbacks as learning opportunities. This approach aligns with the literature on fixed vs. growth mindsets in students, which has often reinforced the view that mastery is a process, and a mastery goal orientation is high associated with a growth mindset (Lou and Noels, 2020; Song et al., 2020). Notably, encouraging the adoption of a growth mindset has been found to increase students' intentions to deliberately use strategies to increase their passion, even when their passion wanes at times (Chen et al., 2021).

One promising strategy universities can implement to reignite students' passion for their field of study is the incorporation of academic internship programs. By providing opportunities for students to gain practical experience applying what they have learned in the classroom, internships can serve as a catalyst for rediscovering one's passion. Chen et al. (2021) identified that gaining practical experience is a key strategy used by students with a growth mindset

to increase their passion. Furthermore, Kargarmoakhar et al. (2021) highlighted the importance of such experiences in fostering self-efficacy and professional identity development. This experiential learning model encourages active student engagement, transforming passive learners into active participants (Aithal and Mishra, 2024). By bridging the gap between theory and practice, internships not only deepen students' understanding but also empower them with a sense of purpose and future direction.

Limitations

Despite the novel findings and meaningful implications, several limitations of the present study should be acknowledged and taken into consideration for the interpretation of the results. First, the sample used was not representative of truly low achieving students. We lacked data points from students who had GPA scores of less than 1.50 (i.e., students who are really struggling in their performance). This might have led to the underestimation or overestimation of relationships between study variables. Future research should aim to obtain a wider range of data points, especially encouraging study participation from low achieving students, to give a more complete view of the relationships between variables. Second, with the exception of students' GPA, the current study relied mostly on self-reported ratings (e.g., burnout, grit, self-efficacy), which could potentially introduce response bias.

Conclusion

Using longitudinal student data of GPA and burnout from a sample of university students in Singapore, with a rather balanced sample by gender and academic program cluster, the current study examined the temporal order of the GPA-burnout relationship and investigated the moderation effects of grit, self-efficacy, and resilience. Two main findings emerged from the study: (1) one's grades significantly influences later burnout. More specifically, students with higher GPA are at a greater risk of suffering from worse burnout later; and (2) this relationship between GPA and burnout depends on whether one has high or low grit-passion. The negative consequences of high GPA on burnout are exacerbated when one demonstrates less passion, whereas the combination of more grit-passion and high GPA leads to lower burnout.

Our study substantively adds to our understanding of how to improve the well-being of students and highlights the detrimental effects of striving purely for better grades without enthusiasm and enjoyment on students. The constant striving for improving and achieving better results may not be sustainable in the long run and is likely to be at the expense of poorer well-being and worse burnout. Educators and universities play a crucial role in helping students rediscover their passion and realize that though grades are important, the process or journey toward it can be made more enjoyable.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval for data collection was sought and obtained from the Institutional Review Board, at the Singapore Institute of Technology (IRB: 20170053). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

SP: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing. SL: Conceptualization, Project administration, Resources, Supervision, Writing – review & editing. X-FKK: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – review & editing. OD: Conceptualization, Project administration, Resources, Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2024.1408058/full#supplementary-material>

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