Temporal development of student burnout symptoms: sociodemographic differences and linkage to university dropout intentions

Derya Turhan, Anne Scheunemann, Theresa Schnettler, Lisa Bäulke, Daniel O. Thies, Markus Dresel, Stefan Fries, Detlev Leutner, Joachim Wirth, Carola Grunschel

Angaben zur Veröffentlichung / Publication details:

Turhan, Derya, Anne Scheunemann, Theresa Schnettler, Lisa Bäulke, Daniel O. Thies, Markus Dresel, Stefan Fries, Detlev Leutner, Joachim Wirth, and Carola Grunschel. 2023. "Temporal development of student burnout symptoms: sociodemographic differences and linkage to university dropout intentions." *Contemporary Educational Psychology* 73: 102185. https://doi.org/10.1016/j.cedpsych.2023.102185.

Temporal development of student burnout symptoms: Sociodemographic differences and linkage to university dropout intentions[☆]

Derya Turhan[a,*], Anne Scheunemann[b], Theresa Schnettler[a], Lisa Bäulke[c], Daniel O. Thies[b], Markus Dresel[c], Stefan Fries[d], Detlev Leutner[e], Joachim Wirth[b], Carola Grunschel[a]

[a] *University of Münster, Germany*
[b] *Ruhr-University Bochum, Germany*
[c] *University of Augsburg, Germany*
[d] *Bielefeld University, Germany*
[e] *University of Duisburg-Essen, Germany*

1. Introduction

Globally, a growing number of students pursue a higher education degree (UNESCO, Institute for Statistics [UIS], 2018). To obtain that degree, students need to overcome an array of demands and stressors throughout their studies (Browning et al., 2021). Undue exposure to stressful experiences can trigger the development of burnout symptoms (cf. Conservation of Resources Theory; Hobfoll, 1989), which are prevalent among university students and bear adverse consequences (Grützmacher et al., 2017; Salmela-Aro et al., 2022). Schaufeli et al. (2002) conceptualized student burnout as a multidimensional phenomenon consisting of *emotional exhaustion* due to incessant study demands, *cynicism* toward one's studies, and *reduced professional efficacy* referring to reduced confidence in one's academic abilities.

The prominent Conservation of Resources (COR) Theory (Hobfoll, 1989) and the Job Demands-Resources (JD-R) Model (Demerouti et al., 2001) posit that chronic demands deplete individuals' resources (e.g., self-esteem) and that such resource depletion can trigger the insidious

☆ The German Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung, BMBF, Grant Numbers 01PX16011A/B/C) funded this research. The authors thank all students who participated in the study.

* Corresponding author at: Department of Educational Psychology, University of Münster, Fliednerstraße 21, 48149 Münster, Germany.
E-mail address: derya.turhan@uni-muenster.de (D. Turhan).

and gradual emergence of detrimental burnout symptoms. Considering this, students' susceptibility to burnout symptoms may differ depending on their available resources. Besides, providing timely support may reduce the risks of developing pronounced burnout symptoms and their possible consequences, such as intentions to drop out of university. The Student Attrition Model (Bean and Metzner, 1985) postulates that psychological factors—among which burnout symptoms are conceivable—reflect the strongest determinants of university dropout intentions.

To date, only few empirical studies tested these theoretical perspectives in the higher education context. Specifically, empirical studies on the temporal development of student burnout are scarce, inconsistent, and limited to distal measurements across years (Ríos-Risquez et al., 2018; Rudman & Gustavsson, 2012). Generally, such distal measurements of student burnout symptoms can miss more nuanced changes that possibly occur *within* semesters as the number and difficulty of academic demands typically increase throughout the semester (cf. Corpus et al., 2020). The identification of those nuanced changes is indispensable for deciding *when* to best address students' adverse experiences and challenges. Longitudinal research pointed to inter-individual differences in the temporal development of student burnout symptoms but did not investigate potential sources (e.g., sociodemographic characteristics) for these differences (Kachel et al., 2020; Rudman & Gustavsson, 2012). These insights, however, could help to identify groups of students who are particularly vulnerable to burnout symptoms. Besides, conflicting findings exist on the association between burnout symptoms and key academic outcomes including university dropout intentions (Mostert and Pienaar, 2020). This evidence should be complemented to draw inferences about the strength and direction of these associations and the relevance of considering burnout symptoms in dropout interventions.

Accordingly, the current longitudinal study pursuit three major aims. First, the overarching aim was to provide more fine-grained insights into the temporal development of each student burnout symptom (emotional exhaustion, cynicism, and reduced professional efficacy) over one semester. Second, we assessed whether the temporal development of each burnout symptom differed depending on students' sociodemographic characteristic (gender, age, study progress, and academic major). Lastly, we sought to provide initial longitudinal evidence on the association between students' symptoms of burnout and intentions to drop out of university before successful graduation. Overall, the current study advanced scientific understanding of (a) the temporal development of student burnout symptoms, (b) inter-individual differences in these symptoms, and (3) the possible role of these symptoms for the globally concerning student dropout rates (Bäulke et al., 2021). Further, these insights feature some implications for particularly the design of tailored and timely burnout interventions.

1.1. The challenging university context

Over the last few decades, empirical findings indicated that university students are subjected to multiple stressors related to incessant academic demands, impaired performance, relationship and financial difficulties, and the continuous management of diverse responsibilities (Stallman & Hurst, 2016). The COVID-19 outbreak exposed several students worldwide to additional unprecedent challenges (e.g., curfews, quarantines, physical distancing, and temporal closure of universities; Browning et al., 2021). Constant exposure to such stressors can contribute to the development or exacerbation of mental disorders (Stallman, 2008), which are widespread among students and seem to be increasing in prevalence as well as severity (Meda et al., 2021). Cross-national studies indicated that roughly one-third of students reported mental disorders (Auerbach et al., 2018), encompassing depressive, anxiety, and substance use disorders in particular (Kang et al., 2021; Meda et al., 2021; Rotenstein et al., 2016).

1.2. Student burnout symptoms in the university context

Challenges in the university context can also trigger the development of detrimental burnout symptoms (cf. Kaggwa et al., 2021), which showed associations with different mental disorder (e.g., depression and alcohol dependence; Cheng et al., 2020; Jackson et al., 2016) in previous empirical studies. Unlike the mental disorders mentioned above, however, burnout is not listed in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association, 2013). In the *International Statistical Classification of Diseases and Related Health Problems* (11th ed.; *ICD-11*; World Health Organization, 2019), burnout is classified exclusively as an occupational phenomenon. This classification seems not reasonable since previous empirical studies also identified the presence of burnout in non-occupational samples such as in university students (Schaufeli et al., 2002). Since the 21st century, researchers have increasingly drawn attention to the alarming prevalence rates of burnout among university students (Grützmacher et al., 2017; Salmela-Aro et al., 2022).

To date, no standard accepted definition of student burnout exists in the scientific literature. We adhere to the definition of student burnout proposed by Schaufeli et al. (2002) as it is most widely used and has received great empirical support internationally (e.g., Portoghese et al., 2018). Following Schaufeli et al. (2002), the three symptoms emotional exhaustion (i.e., feeling exhausted because of excessive study demands), cynicism (i.e., cynical attitudes toward one's studies in general), and reduced professional efficacy (i.e., reduced confidence in one's academic abilities) signify the building blocks of student burnout. In concordance, theoretical models (e.g., by Golembiewski, 1986; Leiter and Maslach, 1988) assert that these symptoms develop sequentially but agreement about the specific developmental order is nonexistent so far.

1.3. The temporal development of student burnout symptoms

Similarly, however, theoretical models state that burnout symptoms do not emerge suddenly. The Conservation of Resources (COR) Theory (Hobfoll, 1989) and the Job-Demands Resources (JD-R) Model (Demerouti et al., 2001) provide the most prominent theoretical frameworks to explain the temporal development of burnout symptoms. These models share the view that excessive stress and chronic demands deplete the resources (e.g., self-esteem and external support) of individuals (Bakker and Demerouti, 2007; Hobfoll, 1989). Continuous depletion of resources can, in turn, foster the gradual emergence of health problems such as burnout symptoms (Bakker and Demerouti, 2007; Freedy and Hobfoll, 1994), emphasizing that these symptoms need to be regarded as a process that develops and unfolds over time. If these symptoms are recognized too late and left untreated, negative academic- and health-related consequences may result (cf. JD-R Theory; Demerouti et al., 2001; Turhan et al., 2022).

Yet, tenets of the COR Theory and the JD-R Model concerning burnout symptoms have scarcely been tested in longitudinal studies in the university context, limiting empirical knowledge about its temporal development in university students. However, understanding changes in burnout symptoms may be especially critical for providing timely support. So far, the limited existing longitudinal empirical research investigated the temporal development of student burnout symptoms across larger time spans. Overall, the results indicated a linear increase or no increase in emotional exhaustion and disengagement/cynicism across years (i.e., about two to four years) and no increase in reduced professional efficacy across such periods (Kachel et al., 2020; Ríos-Risquez et al., 2018; Rudman & Gustavsson, 2012). Generally, those distal measurements of student burnout symptoms can miss more nuanced changes that possibly occur *within* semesters. It is conceivable that students experience an increase in burnout symptoms within semesters because their academic demands, responsibilities and, for example, the pressure of final examinations typically increase during semesters (cf. Corpus et al., 2020).

1.3.1. Sociodemographic differences in the temporal development

Concordant with theoretical postulations, some longitudinal studies also provided initial indications for inter-individual differences in initial levels and developmental trajectories of exhaustion and disengagement/cynicism, as indicated by significant intercept and slope variances (cf. Kachel et al., 2020; Rudman & Gustavsson, 2012). However, these studies did not investigate potential sources for these differences although such insights are paramount for identifying groups of students who are at higher risk. Such differences are reasonable since students are typically endowed with different pools of resources and, thus, possess varying vulnerabilities to burnout symptoms (cf. COR Theory; Hobfoll, 1989; Lesener et al., 2020). As we note below, some prior cross-sectional evidence identified differences in students' degree of burnout symptoms to be attributable to particular sociodemographic characteristics such as to students' gender, age, study progress (i.e., semesters studied at university), and academic major.

Concerning gender, various empirical findings indicated that female students reported higher emotional exhaustion than male students (e.g., Fiorilli et al., 2022). Female students' greater emotional involvement in problems and their greater vulnerability to the adverse effects of these problems may explain these findings (cf. Cohen et al., 2019; Kniffin et al., 2021). In addition, a few researchers found that female students scored lower on cynicism and higher on professional efficacy compared to their male counterparts (Worly et al., 2019). Yet, others revealed no gender differences in cynicism (Salmela-Aro & Read, 2017), in both cynicism and reduced professional efficacy (Amin et al., 2009), or in any of the three student burnout symptoms (Galán et al., 2011; Turhan et al., 2022), indicating that the results are mixed.

Concerning age, a few researchers identified no differences in the student burnout symptoms across university students (e.g., Lee et al., 2020; Wang et al., 2019). Contrary, others found that younger students reported more emotional exhaustion (Aguayo et al., 2019), more professional efficacy and less cynicism (Salmela-Aro & Read, 2017) than their older peers. In general, younger students possess less resources (e.g., task-oriented coping strategies; Cabras and Mondo, 2018) to manage burnout symptoms than older students, wherefore they theoretically appear more prone to greater stress and burnout symptoms (cf. COR Theory; Hobfoll, 1989).

Concerning study progress, some researchers unraveled that emotional exhaustion and cynicism were more pronounced among students in higher academic years (Nteveros et al., 2020; Paro et al., 2014; Salmela-Aro & Read, 2017). Possible unfavorable experiences throughout their more advanced academic careers (e.g., diminished academic performance, conflicts with peers, and financial difficulties) and perhaps increasing struggle and dissatisfaction with study content and conditions may account for these findings. To date, empirical findings on study progress differences in reduced professional efficacy are inconsistent. Salmela-Aro and Read (2017) identified lower levels of professional efficacy among students in higher semesters, while Paro et al. (2014) found these levels to be lower among students in lower semesters, and Nteveros et al. (2020) found no significant differences at all.

Concerning academic major, several researchers identified elevated levels of burnout in students enrolled in one particular major, such as nursing or medicine (Rudman & Gustavsson, 2012; Worly et al., 2019). Gusy et al. (2012) and Grützmacher et al. (2017) also identified that student burnout levels differed across students enrolled in different academic majors. In both studies, mathematics/natural sciences students, also referred to as STEM students, reported the highest emotional exhaustion levels while social sciences students reported the lowest levels. STEM students are also highly susceptible to reduced motivation and dropout (Chen and Soldner, 2013; Robinson et al., 2019), wherefore they seem to be an at-risk group requiring particular attention and support. Grützmacher et al. (2017) further found that medical/health sciences students reported lower cynicism than students enrolled in law, economics, engineering, mathematics, social sciences, or linguistics- and cultural sciences. With regard to reduced professional efficacy, Gusy et al. (2012) and Grützmacher et al. (2017) did not identify any differences by academic major.

Summarizing, empirical findings indicated that the levels of student burnout symptoms may differ depending on the sociodemographic characteristics of students. Yet, these findings are entirely based on cross-sectional data and are inconclusive in some respects (i.e., regarding gender, age, and study progress) and limited in others (i.e., regarding academic major), implying the need for more extensive research, including longitudinal research, on these issues. Amongst other things, longitudinal research can identify whether certain student groups are more strongly affected by burnout symptoms as time progresses and therefore require particular support.

1.4. Consequences of student burnout symptoms

Experiencing burnout symptoms can have multiple negative consequences for students. For example, some researchers identified associations between elevated student burnout levels and mental disorders such as depressive, eating, and substance use disorders (Galán et al., 2014; Jackson et al., 2016; Kristanto et al., 2016). Others highlighted that student burnout related to adverse academic outcomes such as impairments in academic performance (Madigan and Curran, 2020), reduced study engagement, (Schaufeli et al., 2002), reduced study- and life satisfaction (Turhan et al., 2022), and increased dropout intentions (Mostert and Pienaar, 2020). Further, a few researchers showed that students with high burnout levels tended to face an increased risk of burnout later in the workforce (Robins et al., 2017), which, in turn, associated with adverse work-related outcomes (e.g., impaired work performance and absenteeism; Dyrbye et al., 2019).

1.4.1. Linkage of student burnout symptoms to university dropout intentions

Over the last decade, the association between student burnout and intentions to drop out from university received a particular growing research attention in the educational field (Moneta, 2011; Mostert and Pienaar, 2020). Globally, student dropout is highly prevalent (up to 50 %; Organization for Economic Co-Operation and Development [OECD] 2018) and involves negative consequences for students (e.g., financial burden), institutions (e.g., reputation drop), and society (e.g., waste of educational resources; Schnepf, 2017; Williams et al., 2018). Thus, students' decision to drop out of university can eventually affect different parties. Considering this, internationally increasing empirical research on the development of dropout decisions (e.g., Bäulke et al., 2021) and on endeavors to achieve higher retention rates (e.g., Canning et al., 2018; Booij et al., 2017; Van Klaveren et al., 2019) are no surprise.

Congruent with Bäulke et al. (2021), we describe student dropout as a situation in which a student leaves the university permanently. The well-established Student Attrition Model (Bean and Metzner, 1985) postulates that students' intent to leave, also referred to as dropout intention, is the most reliable and proximal determinant of actual dropout (cf. Mashburn, 2000). Empirical findings echo this postulation (Thomas, 2000). The Student Attrition Model posits that the formation of dropout intentions can be influenced by background, environmental, academic, and psychological factors, of which the latter are expected to be the strongest influencing factors (Bean and Metzner, 1985). Symptoms of burnout are conceivable as those psychological factors.

Cross-sectional evidence concerning the association between student burnout and dropout intentions is, however, inconclusive so far. Thus, insufficient empirical knowledge exists about whether burnout symptoms should play a more salient role in endeavors to achieve lower dropout rates. While some empirical studies identified all student burnout symptoms (i.e., emotional exhaustion, cynicism, and reduced professional efficacy) as significant predictors of dropout intentions (Mostert and Pienaar, 2020), others only identified two (i.e., cynicism and reduced professional efficacy; Moneta, 2011) or one (i.e., cynicism; Cortes et al., 2014) of the symptoms as meaningful predictors. Cynicism was thus the only consistently identified predictor of dropout intentions in these cross-sectional studies. Longitudinal evidence concerning this association is still scarce and, to our knowledge, only Rudman and Gustavsson (2012) have offered some insights. The authors unraveled that nursing students who experienced higher exhaustion and disengagement/cynicism in their final year of education reported higher intentions to drop out from the nursing profession one year after graduation.

2. The current study

Globally, several university students report adverse symptoms of burnout (Grützmacher et al., 2017; Salmela-Aro et al., 2022). Theoretical models state that burnout develops gradually over time (Demerouti et al., 2001; Hobfoll, 1989). Thus far, empirical evidence on the temporal development of student burnout symptoms within semesters is nonexistent. These insights, however, can help to identify nuanced changes in symptom levels and inform about the best timing of interventions. Further, limited evidence exists on inter-individual differences in the temporal development of burnout symptoms although such insights can help to identify student groups who seem at higher risk of developing these symptoms. In addition, there is insufficient evidence on the extent to which changes in student burnout symptoms associate with adverse academic outcomes such as university dropout intentions. Yet, that evidence can contribute to a better understanding of the relevance of these symptoms for such outcomes.

Accordingly, the current study had three aims. Our *first and main research aim* was to examine the initial levels of each separate student burnout symptom (emotional exhaustion, cynicism, and reduced professional efficacy) and the trajectories of these symptoms within one semester among undergraduate students in Germany. Considering theoretical models (Demerouti et al., 2001; Hobfoll, 1989) and the steadily increasing demands within semesters, we hypothesized that each symptom increases (linearly) as the semester progresses (*Hypothesis 1*).

Our *second research aim* was to examine whether the initial levels and trajectories of student burnout symptoms differed across particular sociodemographic characteristics of students, namely across their gender, age, study progress (i.e., number of semesters studied at university), and academic major. Cross-sectional results concerning gender, age, and study progress differences in these symptoms are contradictory, while those concerning academic major differences are scarce (Grützmacher et al., 2017; Salmela-Aro & Read, 2017). To our knowledge, examinations of sociodemographic differences in the trajectories of these symptoms are nonexistent so far. Given theoretical models suggesting that individuals' susceptibility to burnout symptoms varies depending on their resources (cf. Hobfoll, 1989), we generally hypothesized that some significant sociodemographic differences exist (*Hypothesis 2*). Yet, we had no specific assumption as to the direction of these differences due to ambiguous results of empirical studies.

Our *third research aim* was to examine the extent to which the initial levels and trajectories of each separate student burnout symptom predict students' intentions to drop out from university at the end of the semester. Of the three student burnout symptoms, cross-sectional studies consistently identified cynicism but not emotional exhaustion or reduced professional efficacy as a significant predictor of dropout intentions (Mostert and Pienaar, 2020; Turhan et al., 2022). Longitudinal studies identified exhaustion and disengagement/cynicism as meaningful predictors of dropout intentions but did not examine the predictive role of reduced professional efficacy (Rudman & Gustavsson, 2012). The Student Attrition Model (Bean and Metzner, 1985) suggests that psychological outcomes (among which all burnout symptoms are conceivable) reflect the strongest predictors of dropout intentions. Considering these theoretical perspectives and recent findings (Turhan et al., 2022), we hypothesized that higher initial levels and increases in each symptom associate with higher dropout intentions (*Hypothesis 3*).

Summarizing, the examination of these hypotheses and research questions allows us to provide more in-depth insights into the temporal development of each unique student burnout symptom within one semester, to shed initial light into which sociodemographic groups are particularly affected by student burnout symptoms, and to yield initial indications to what extent student burnout symptoms play a role in the formation of dropout intentions. These theoretical insights also feature practical implications regarding the timing of burnout interventions (i.e., appropriate timing is critical to prevent pronounced symptoms and untoward effects of these symptoms), regarding the design of tailored interventions (i.e., student groups that appear to be at higher risk for burnout symptoms require special attention and support), and regarding the necessity to address these symptoms in interventions aimed at reducing student dropout rates.

3. Method

3.1. Procedure

To address our hypotheses and research questions, we conducted a longitudinal study and collected data simultaneously at three accredited German universities after the Ethical Committee of the Department of Psychology of Bielefeld University granted ethical approval (2018–181). This study included a total of thirteen measurement occasions spread across the 2018–2019 fall semester and the 2021 summer semester. It was conducted in full accordance with the ethical principles of German Psychological Society (DGPs) and the German Association of Professional Psychologists (BDP). These principles represent the German adaptation of the ethical guidelines of the American Psychological Association. The 2018–2019 fall semester included three measurement occasions, the next three semesters (2019 summer semester, 2019–2020 fall semester, and 2020 summer semester) included one measurement occasion, the 2020–2021 fall semester included four measurement occasions, and lastly the 2021 summer semester included three measurement occasions. The overarching aim of this thirteen-wave longitudinal study was to examine the risk factors of student dropout intentions from a motivation- and action-regulation perspective among students who were enrolled in STEM fields, economics, humanities, and law. The rationale for focusing on these academic majors was that previous studies in German higher education identified particularly high dropout rates in STEM fields but also elevated and thus worrisome dropout rates in other majors including economics, humanities, and law (Neugebauer et al., 2019). Hence, the study inclusion criterion was that students had to be enrolled in one of the abovementioned academic majors (i.e., in STEM fields, economics, humanities, or law).

The recruitment of this thirteen-wave longitudinal study started at the beginning (October 11th until November 11th) of the 2018–2019 fall semester (i.e., at T_1) by approaching first-, third-, and fifth-semester students during their lectures. In these lectures at T_1, we briefly informed students about the study goals and asked them to fill out a contact form if they were interested in voluntary participation. Contact forms helped identify students who met the study inclusion criterion and to invite them to an introductory meeting held shortly afterward. As mentioned above, all students enrolled in STEM fields, economics, humanities, and law could participate. Students who provided incomplete answers at T_1 ($n = 42$) or reported a major that was not the focus of the study ($n = 6$) were excluded from this study. In the introductory meeting, students obtained more information about the study including data privacy protection and security, gave informed consent, and received an initial gift worth € 5 to promote their participation motivation. We then sent students an e-mail with a link that forwarded them to the first online survey. The amount of incentive for participation depended on the students' individual compliance rate. In addition to the initial gift worth € 5, the students could receive up to € 121 at the end of this thirteen-wave longitudinal study (T_1 to T_4 = € 45; T_5 to T_6 = € 26; and T_7 to T_{13} = € 50).

For the purpose of the current study, we used an excerpt of the data from the beginning (T_1, October 2018), middle (T_2, December 2018), and end (T_3, February 2019) of the 2018–2019 fall semester for the fine-grained analysis of student burnout trajectories. Time lags between these first three measurement occasions were about six weeks. During these three measurement occasions, students could receive € 10 at T_1, € 5 at T_2, and € 5 at T_3.

3.2. Participants

A total of $N = 1435$ undergraduate students fulfilled the study inclusion criteria at T_1. A total of $N = 1172$ students participated at T_2 and $N = 1096$ at T_3, resulting in a satisfactory attrition rate of 24 % across the three measurement occasions as compared to other longitudinal studies (Deng et al., 2013). As indicated in Table 1, of the total sample at T_1, $n = 856$ students were female, the mean age of students was 20.81 years ($SD = 2.71$), and they had completed an average of 3.28 ($SD = 2.81$) semesters at university. The majority of students were enrolled in economics (36 %), followed by STEM disciplines (29 %), law (22 %), and humanities (13 %). On average, the self-reported High-School GPA was 2.32 ($SD = 0.56$) and the University GPA was 2.48 ($SD = 0.62$). GPA in Germany ranges from 1.0 to 4.0, where a smaller GPA reflects a better performance. About 30 % of students reported having a migration background and up to 40 % of students worked five or more hours per week asides their university studies. The percentage of students who had children (0.6 %), engaged in voluntary jobs (7.7 %), and cared for relatives (1.5 %) was rather low.

3.3. Variables and measures

In the following, we only describe the measures relevant to the current study. All students who are included in this study have completed these measures in online-surveys at least at T_1.

3.3.1. Student burnout symptoms

Student burnout symptoms were measured by the German short version of the Maslach Burnout Inventory-Student Survey (MBI-SS-KV; Wörfel et al., 2015). The MBI-SS-KV comprises three symptoms, each with three items. These symptoms include emotional exhaustion (e.g., "Studying or attending class is really a strain for me"; McDonald's $\omega_{T1-T3} = 0.77–0.86$), cynicism (e.g., "I have become less enthusiastic about my studies"; McDonald's $\omega_{T1-T3} = 0.87–0.91$), and reduced professional efficacy (e.g., "I believe I cannot make an effective contribution to the classes that I attend"; McDonald's $\omega_{T1-T3} = 0.74–0.77$). Students answered the items on a 7-point Likert scale running from minimum 1 (=*never*) to maximum 7 (=*always*). High item scores indicate high levels in all student burnout symptoms. The subscales yielded good internal consistency at each measurement occasion in this longitudinal study with McDonald's ω ranging from 0.74 to 0.91 and in the cross-sectional study of Wörfel et al. (2015) with Cronbach's alpha ranging from 0.73 to 85. In addition, contemporary psychometric research indicated that the MBI-SS-KV demonstrates convergent validity, factorial validity, and measurement invariance across gender and time (Turhan et al., 2021).

3.3.2. University dropout intentions

Students' intentions to drop out from university were measured by the subscale "Thoughts of quitting studies completely" of Bäulke et al. (2021) that comprises three items (e.g., "At the moment I'm considering quitting my studies"). Students rated the items on a 6-point Likert scale ranging from minimum 1 (=*disagree completely*) to maximum 6 (=*agree completely*). High item scores indicate high dropout intentions. This scale showed good internal consistency in the current study (McDonald's $\omega_{T3} = 0.80$) and in Bäulke et al. (2021; McDonald's $\omega = 0.89$). Bäulke et al. (2021) further indicated that this subscale shows factorial validity.

3.3.3. Sociodemographic characteristics

We used four sociodemographic characteristics reported by students, namely gender (1 = female, 2 = male), age, study progress (i.e., semesters studies at university), and academic major. Convergent with prior research (Gansemer-Topf et al., 2017), we collapsed academic majors into a dichotomous variable indicating enrollment in STEM fields or another major, with 1 = STEM student (29 % of our sample), 2 = economics/humanities/law student (71 % of our sample).

Table 1
Sociodemographic Characteristics of the Sample.

Sociodemographic Characteristics		n	%
Gender			
	Female	856	59.7
	Male	579	40.3
Age		—	—
	17–21	1042	72.6
	22–26	351	24.5
	27 or older	42	2.9
Study Progress[a]		—	—
	1–3	956	66.6
	4–6	307	21.5
	7–9	123	8.5
	10 or more	49	3.4
Academic Major		—	—
	Economics	516	36.0
	STEM disciplines	423	29.5
	Law	312	21.7
	Humanities	184	12.8
Migration Background[b]		—	—
	Student	123	8.6
	Mother	406	28.3
	Father	395	27.5
Children[c]		9	0.6
Paid Job[d]		580	40.4
Voluntary Job[e]		110	7.7
Caring for Relatives		22	1.5

Note. The total sample comprised $N = 1435$ students. [a] number of semesters studied at university; [b] birth outside of Germany; [c] students that have one or more children; [d] students that work five or more hours per week; [e] students that do a voluntary job for five or more hours per week.

3.4. Statistical analyses

To examine our hypotheses and research questions, we conducted all statistical analyses with Mplus 8.7 software (Muthén & Muthén, 1998–2017). First, we conducted preliminary analyses that included the examination of panel attrition, descriptive statistics, normal distribution of the results (skewness and kurtosis), and bivariate correlations of all variables of interest. For panel attrition, we analyzed whether the participant attrition had associations with the student burnout symptoms (emotional exhaustion, cynicism, and reduced professional efficacy) and university dropout intentions. Significant group differences point to the presence of systematic attrition (Enders, 2010), which we identified in the current study (see Section "4.1.1. Panel Attrition"). To address the systematic attrition, we used multiple imputations given their advantages as compared to the use of, for example, complete cases (e.g., reduction of data waste and biased results; Asendorpf et al., 2014). To this end, we adhered to the guidelines of Geiser et al. (2021). The preliminary analyses also comprised the assessment of whether each separate student burnout factor (i.e., emotional exhaustion, cynicism, and reduced professional efficacy) demonstrated longitudinal measurement invariance that is a critical prerequisite to drawing legitimate conclusions about the developmental trajectories of these student burnout factors (cf. Widaman et al., 2010).

To test for longitudinal measurement invariance, we adhered to the guidelines of Widaman and Reise (1997). For each separate student burnout factor, we used a step-wise approach to compare a series of four nested models with increasing invariance constraints. We compared (1) a model that tested for *configural invariance* by constraining the factor structure to be equal across time, (2) a model that tested for *metric invariance* by additionally constraining the factor loadings to be equal across time, (3) a model that tested for *scalar invariance* by additionally constraining the item intercepts to be equal across time, and (4) a model that tested for *uniqueness invariance* by additionally constraining the residual variances to be equal across time. When the imposition of increasing invariance constraints results in no substantial changes in goodness-of-fit indices between nested models, the corresponding degree of invariance can be assumed. Cheung and Rensvold (2002) and Chen (2007) suggested evaluating different fit indices, including the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). For large sample sizes, they recommended to use cut-off values of ΔCFI = -0.010, ΔRMSEA = 0.015, and ΔSRMR = 0.030 for metric invariance and ΔSRMR = 0.010 for scalar and uniqueness invariance. We used the degree of longitudinal measurement invariance identified for the student burnout factors in all subsequent second-order latent growth curve (LGC; Bollen and Curran, 2006) models.

Subsequently, we continued with the main analyses. To estimate the initial levels and unique developmental trajectories of each separate student burnout factor (*Hypothesis 1*), we performed three linear *unconditional* second-order LGC models. These models included a latent factor of student burnout (i.e., emotional exhaustion, cynicism, or reduced professional efficacy) at each measurement occasion, an intercept growth factor (i.e., indicating initial levels at T_1), and a slope growth factor (i.e., describing developmental trajectories). To exemplify, a model included emotional exhaustion at each measurement occasion, an intercept growth factor that indicated the initial level of emotional exhaustion at T_1, and a slope growth factor that described the developmental change of emotional exhaustion over time. To specify a linear LGC model, we fixed the time scores for the slope growth factor at 0, 1, and 2. Further, we fixed the coefficients of the intercept growth factor at 1 (cf. Muthén & Muthén, 1998–2017).

To investigate whether sociodemographic differences existed in the initial levels (i.e., intercepts) and trajectories (i.e., slopes) of the student burnout factors (*Hypothesis 2*), we conducted three *conditional* second-order LGC models. Specifically, we investigated whether the initial levels and trajectories differed across gender, age, study progress, and academic major. In these models, we further evaluated whether the initial levels and trajectories of the student burnout factors significantly predicted university dropout intentions at T_3 (*Hypothesis 3*). In sum, we simultaneously added gender, age, study progress, and academic major as predictors and university dropout intentions at T_3 as an outcome of the intercept and slope to each unconditional second-order LGC model.

To evaluate the goodness of fit of the estimated *unconditional* and *conditional* second-order LGC models, we used four indicators: χ^2 test statistic, RMSEA, SRMR, and CFI. For RMSEA and SRMR values of $\leq$ 0.08 resemble an acceptable fit (Browne and Cudeck, 1998), and values of $\leq$ 0.06 a good fit (Weston et al., 2008). In addition, CFI values $\geq$ 0.90 are indicative for an acceptable fit (Hoyle, 1995) and CFI values of $\geq$ 0.95 a good fit (Weston et al., 2008).

4. Results

4.1. Preliminary analyses

4.1.1. Panel attrition

At first, we investigated the participant attrition from the present study and the potential associations of this attrition with our central variables of interest. We specified one-way ANOVAs for each student burnout factor and university dropout intentions to examine potential differences among our participants who (1) answered questionnaires at all three measurement points (n = 1,063, 74.1 %), (2) answered questionnaires at only two measurement points (n = 142, 9.9 %), and (3) those who answered questionnaires at T_1 only (n = 230, 16.0 %). The results indicated no significant mean differences for emotional exhaustion, $F(2, 1432) = 0.65$, $p = 0.52$, and reduced professional efficacy, $F(2, 1432) = 0.39$, $p = 0.68$. Yet, significant mean differences were identified for cynicism, $F(2, 1432) = 5.77$, p =.01, and dropout intentions $F(2, 1432) = 3.25$, p =.04, meaning that there was systematic attrition in this study. To manage this attrition data, we adhered to recommendations by Asendorpf et al. (2014) and used multiple imputations with 50 imputations. The subsequent results are based on the imputed data set.

4.1.2. Descriptive statistics and bivariate correlations

Table 2 reports the descriptive statistics, including means and standard deviations for student burnout factors at each measurement occasion and for dropout intentions at T_3. As Table 2 indicates, skewness values (ranging between 0.092 and 1.19) and kurtosis values (ranging between –0.455 and 1.23) were below the criterion of 1.96 (cf. Field et al., 2013). Thus, the results were (approximately) normally distributed and well-suited for parametric statistical analyses. In general, means for emotional exhaustion were at all times more pronounced (i.e., in the middle area) than those for cynicism and reduced professional efficacy. As expected, an increase in means was noted for all student burnout factors, indicating that, on average, students experienced more elevated burnout symptoms over time. Corresponding standard deviations were all greater than one at T_1 and grew over the semester, pointing to pronounced inter-individual differences in the initial levels of the student burnout factors and to an increase in these differences over time. The mean for dropout intentions was below the scale mean, indicating that, on average, students had rather low intentions to drop out from university at T_3. Table 3 presents the correlations between the variables of interest. In short, the intercorrelations between the student burnout symptoms were high and, as expected, the symptoms positively correlated with dropout intentions and showed significant associations with students' sociodemographic characteristics.

4.1.3. Longitudinal measurement invariance of student burnout factors

The student burnout factors have to demonstrate longitudinal measurement invariance to draw accurate conclusions about their developmental trajectories (cf. Widaman et al., 2010). The imposition of increasing invariance constraints did not result in substantial differences of goodness-of-fit indices (i.e., CFI, RMSEA, and SRMR) between most nested models (see Table 4). Specifically, the student burnout factor emotional exhaustion demonstrated scalar invariance (i.e., equal factor structure, factor loadings, and item intercepts across measurement occasions; Chen, 2007). In addition, the student burnout factors cynicism and reduced professional efficacy demonstrated uniqueness longitudinal measurement invariance, meaning that these factors were measured on the identical metric over time (i.e., equal factor structure, factor loadings, item intercepts, and residual variances across measurement occasions). Thus, the critical prerequisite to drawing legitimate conclusions about the developmental trajectories of these student burnout factors was met. We selected the respective degrees of invariance for all student burnout factors in all subsequent second-order unconditional and conditional LGC models.

4.2. Main analyses

4.2.1. Temporal development of student burnout factors within one academic semester

Table 5 summarizes the goodness-of-fit indices of the estimated *unconditional* second-order LGC models that we conducted to assess the initial levels (i.e., intercepts) and trajectories (i.e., slopes) of each student burnout factor over one semester (*Hypothesis 1*). As indicated by the goodness-of-fit indices (i.e., CFI, RMSEA, and SRMR), these models fit the data satisfactorily. Thus, the *unconditional* second-order LGC models with a linear slope growth factor satisfactorily described the average pattern of change in the burnout factors over one semester.

Table 6 shows the unstandardized parameter estimates of the

Table 2
Descriptive Statistics of Student Burnout Factors and Dropout Intentions.

Scales	T_1				T_2				T_3			
	M	*SD*	Skewness	Kurtosis	*M*	*SD*	Skewness	Kurtosis	*M*	*SD*	Skewness	Kurtosis
Emotional exhaustion	3.47	1.25	0.276	-0.294	3.82	1.30	0.201	-0.432	3.89	1.35	0.092	-0.455
Cynicism	2.25	1.24	1.19	1.23	2.56	1.32	0.908	0.399	2.70	1.44	0.804	-0.025
Reduced professional efficacy	3.02	1.25	0.337	-0.250	3.28	1.26	0.254	-0.226	3.35	1.31	0.249	-0.110
Dropout intentions	—	—	—	—	—	—	—		2.17	1.11	1.057	.590

Note: $N = 1435$. The scale of the student burnout factors ranges from 1 to 7. The scale of dropout intentions ranges from 1 to 6.

Table 3
Latent Correlations Between Sociodemographics, Student Burnout Factors, and Dropout Intentions.

Scales	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Gender[a] T_1	0.01	0.03	−0.32**	0.02	−0.04	−0.05	0.01	−0.02	−0.01	−0.08*	−0.08**	−0.06*	−0.09**
2. Age T_1	—	0.59**	0.00	−0.02	0.02	0.02	0.05	0.04	0.01	0.03	0.00	0.01	−0.05
3. Academic semester T_1		—	−0.08**	0.07*	0.05	0.05	0.08**	0.05	0.02	0.08*	0.03	0.01	−0.09**
4. Academic major[b] T_1			—	−0.05	−0.07*	−0.06	0.03	−0.02	−0.01	0.03	−0.01	−0.03	−0.03
5. Emotional exhaustion T_1				—	0.66**	0.60**	0.45**	0.35**	0.31**	0.48**	0.39**	0.37**	0.28**
6. Emotional exhaustion T_2					—	0.70**	0.34**	0.48**	0.38**	0.40**	0.50**	0.47**	0.35**
7. Emotional exhaustion T_3						—	0.30**	0.38**	0.48**	0.38**	0.42**	0.57**	0.39**
8. Cynicism T_1							—	0.59**	0.53**	0.55**	0.40**	0.41**	0.42**
9. Cynicism T_2								—	0.67**	0.38**	0.58**	0.47**	0.57**
10. Cynicism T_3									—	0.33**	0.42**	0.63**	0.65**
11. Reduced professional efficacy T_1										—	0.57**	0.55**	0.38**
12. Reduced professional efficacy T_2											—	0.63**	0.46**
13. Reduced professional efficacy T_3												—	0.57**
14. Dropout intentions T_3													—

Note. $N = 1435$. T_1, T_2, and T_3 reflect the three measurement occasions. [a] 1 = females and 2 = males. [b] 1 = STEM students and 2 = economics/humanities/law students. $^{*}p < .05$. $^{**}p < .01$.

Table 4
Fit Statistics for Longitudinal Measurement Invariance of Student Burnout Factors.

Model	χ^2	*df*	CFI	RMSEA	SRMR
Emotional Exhaustion					
M1: configural invariance	67.41	15	0.991	0.049	0.019
M2: metric invariance	85.66	19	0.989	0.049	0.028
M3: scalar invariance	118.16	23	0.984	0.054	0.030
M4: uniqueness invariance	196.25	29	0.971	0.063	0.042
Cynicism					
M1: configural invariance	39.77	15	0.996	0.034	0.018
M2: metric invariance	56.25	19	0.993	0.037	0.023
M3: scalar invariance	67.52	23	0.992	0.037	0.024
M4: uniqueness invariance	62.38	29	0.994	0.028	0.024
Reduced Professional Efficacy					
M1: configural invariance	10.16	15	1.00	0.001	0.008
M2: metric invariance	17.26	19	1.00	0.003	0.014
M3: scalar invariance	36.98	23	0.997	0.009	0.016
M4: uniqueness invariance	42.14	29	0.997	0.017	0.019

Note. $N = 1435$ using the multiple imputation method. χ^2 = Yuan-Bentler robust test statistic; *df* = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

unconditional second-order LGC models. The intercepts indicated that, on average, students reported moderate levels of emotional exhaustion, cynicism, and reduced professional efficacy at T_1. The significant positive slopes in all three models indicated that, as expected, these levels

Table 5
Fit Statistics for Linear Unconditional Second-Order Latent Growth Curve Models.

	χ^2	*df*	CFI	RMSEA	SRMR
Emotional exhaustion	155.49	24	0.978	0.062	0.036
Cynicism	74.38	30	0.992	0.032	0.028
Reduced professional efficacy	50.06	30	0.995	0.021	0.021

Note. $N = 1435$ using the multiple imputation method. χ^2 = Yuan-Bentler robust test statistic; *df* = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

Table 6
Unstandardized Parameters for the Temporal Development of the Student Burnout Factors.

Model	Intercept Mean	Variance	Slope Mean	Variance	Covariance
Emotional exhaustion	3.81*** (0.04)	0.89*** (0.08)	0.21*** (0.02)	0.12*** (0.03)	–0.04 (0.04)
Cynicism	2.31*** (0.03)	1.08*** (0.10)	0.26*** (0.02)	0.20*** (0.05)	–0.02 (0.05)
Reduced professional efficacy	3.31*** (0.04)	0.83*** (0.09)	0.19*** (0.02)	0.06 (0.04)	0.02 (0.05)

Note. Standard errors are presented in parentheses.
$^{***}p < .001$.

increased linearly over the semester for the sample overall. In addition, our results revealed that the intercept variances were significant for each student burnout factor, while the slope variances were significant for emotional exhaustion and cynicism but not for reduced professional efficacy. In other words, students differed in their initial levels on all student burnout factors. However, their trajectories differed on emotional exhaustion and cynicism only. Given these differences, the examination of inter-individual of the student burnout factors seems rational (cf. Byrne and Crombie, 2003). The covariances between the intercepts and slopes were not significant for any factor, indicating that the change in each factor did not depend on the individual's initial levels of burnout symptoms.

Sociodemographic differences in temporal development of student burnout factors

To assess whether students' sociodemographic characteristics (i.e., gender, age, study progress, and academic major) may account for a proportion of inter-individual differences in the initial levels and trajectories of the student burnout factors over the semester (*Hypothesis 2*), we estimated *conditional* second-order LGCs. Table 7 indicates that all *conditional* second-order LGC models fit the data remarkably well. The standardized regression coefficients for the sociodemographic characteristics as predictors of the initial levels (intercepts) and trajectories (slopes) are presented in Table 8. We comment on the results in the following.

Gender Differences. Gender was negatively and significantly associated with the intercept of reduced professional efficacy, meaning that, on average, female students reported lower professional efficacy at T_1 than male students. In addition, gender was negatively and significantly associated with the linear slope of emotional exhaustion, indicating that increasing emotional exhaustion occurred among female students rather than among their male counterparts. We did not detect significant gender differences in the intercepts of emotional exhaustion and cynicism or in the linear slope of cynicism and reduced professional efficacy.

Age Differences. Significant age differences did not exist in the intercepts and linear slopes of the student burnout factors. Thus, the initial levels and trajectories of emotional exhaustion, cynicism, and reduced professional efficacy did not meaningfully differ with regard to the age of students.

Study Progress Differences. Study progress was positively and significantly related with the intercepts of emotional exhaustion and reduced professional efficacy, indicating that, on average, students in higher semesters reported greater emotional exhaustion and reduced professional efficacy at T_1 than students in lower semesters. Yet, as indicated by the significant negative linear slopes, lower semester students reported greater increases in reduced professional efficacy over time than higher semester students. Significant study progress differences did not exist in the intercept of cynicism and linear slopes of emotional exhaustion and cynicism.

Academic Major Differences. Academic major was negatively and significantly related to the linear slope of cynicism. STEM students thus, on average, exhibited increases in cynicism over the semester that were significantly higher than those of economics/ humanities/law students. Academic major differences in the initial levels of all student burnout factors and in trajectories of emotional exhaustion and reduced professional efficacy were not present.

Table 7
Fit Statistics for Linear Conditional Second-Order Latent Growth Curve Models.

Model	χ^2	*df*	CFI	RMSEA	SRMR
Emotional exhaustion	357.10	90	0.971	0.045	0.036
Cynicism	237.81	96	0.986	0.032	0.031
Reduced professional efficacy	243.47	96	0.980	0.033	0.030

Note. $N = 1435$ using the multiple imputation method. χ^2 = Yuan-Bentler robust test statistic; *df* = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

4.2.2. *Linkage of the temporal development of student burnout factors and university dropout intentions*

The well-fitting conditional second-order LGCs also served to investigate whether the intercepts and slopes of the student burnout factors predicted university dropout intentions at the end of the semester (i.e., at T_3; *Hypothesis 3*). Standardized regression coefficients shown in Table 9 indicate that the intercepts and slopes of all student burnout factors positively and significantly predicted university dropout intentions at T_3. Thus, as expected, students with higher emotional exhaustion, cynicism, and reduced professional efficacy at T_1 seemed more likely to possess higher dropout intentions at T_3. Also as expected, the increase in emotional exhaustion, cynicism, and reduced professional efficacy over the semester predicted students' intentions to drop out from university at T_3.

5. Discussion

A growing body of research indicates that student burnout symptoms are globally widespread (Salmela-Aro et al., 2022). So far, limited empirical studies exist on the temporal development of these symptoms and on the extent to which their development varies across sociodemographic groups and associates with students' intentions to drop out from university. These insights, however, are particularly indispensable to decide *when to best* provide students with timely support and to identify *which student groups* are particularly susceptible to these symptoms. In addition, these insights can cast light into the role of these symptoms for the concerning dropout rates. The current study aimed to address these shortcomings in student burnout research by analyzing data of undergraduate students in Germany over one semester.

5.1. *Temporal development of student burnout factors within one academic semester*

5.1.1. *Burnout levels at the beginning of the academic semester*

Congruent with previous cross-sectional research in the German and Italian higher education context (Portoghese et al., 2018; Wörfel et al., 2015), we unraveled that the average initial level of emotional exhaustion was higher (i.e., in the middle area) than the average initial levels of cynicism and reduced professional efficacy. University students were thus more likely to start the semester with greater emotional exhaustion due to study demands rather than feeling cynical and detached from their studies or feeling incompetent as a student. This finding aligns with the developmental process model by Leiter and Maslach (1988) that suggests that emotional exhaustion is the initial symptom, an early warning sign, of the burnout phenomenon. The quick detection of this symptom could thus be helpful to offer students timely support.

5.1.2. *Trajectories of burnout symptoms over the course of the academic semester*

Similar to Kachel et al. (2020) and Rudman & Gustavsson (2012) and as expected, our fine-grained analyses indicated that each examined student burnout symptom increased linearly as the academic semester progressed. That is, feelings of emotional exhaustion, cynicism, and reduced professional efficacy across university students grew *within* the semester (cf. *Hypothesis 1*). The observed gradual increase in these burnout symptoms aligns with theoretical expectations (e.g., COR Theory by Hobfoll, 1989) that suggest that these symptoms develop and unfold over time rather than emerging spontaneously. Student burnout symptoms should thus be closely monitored during the semester for offering timely support and preventing the development of pronounced symptoms. Those pronounced symptoms can not only negatively associate with students' health and academic outcomes during their studies (Turhan et al., 2022) but also increase their susceptibility to burnout

Table 8
Standardized Parameters for Sociodemographic Differences in the Temporal Development of the Student Burnout Factors.

Predictors	Emotional exhaustion		Cynicism		Reduced professional efficacy	
	Intercept	Slope	Intercept	Slope	Intercept	Slope
Gender[a]	0.01 (0.04)	−0.19** (0.06)	0.04 (0.04)	−0.08 (0.05)	−0.09* (0.04)	−0.01 (0.05)
Age	−0.06 (0.04)	0.08 (0.07)	0.03 (0.04)	−0.04 (0.05)	−0.02 (0.05)	0.03 (0.05)
Study Progress	0.13** (0.04)	−0.15 (0.08)	0.07 (0.04)	−0.11 (0.06)	0.09* (0.05)	−0.19** (0.06)
Academic major[b]	−0.06 (0.04)	−0.09 (0.06)	0.03 (0.04)	−0.09* (0.05)	−0.04 (0.04)	−0.05 (0.07)

Note. Standard errors are presented in parentheses. [a]1 = females and 2 = males. [b]1 = STEM students and 2 = economics/humanities/law students.
$^{*}p < .05$. $^{**}p < .01$.

Table 9
Standardized Parameters for the Linkage between the Temporal Development of Student Burnout Factors and Dropout Intentions.

Outcome	Emotional exhaustion		Cynicism		Reduced professional efficacy	
	Intercept	Slope	Intercept	Slope	Intercept	Slope
Dropout intentions	0.32*** (0.04)	0.27*** (0.07)	0.49*** (0.03)	0.45*** (0.06)	0.41*** (0.04)	0.56*** (0.09)

Note. Standard errors are presented in parentheses.
$^{***}p < .001$.

symptoms later in the workforce (Robins et al., 2017).

5.1.3. *Inter-individual differences in initial levels and trajectories*

Longitudinal research provided initial indications for inter-individual differences in initial levels and trajectories of student burnout symptoms (Rudman &Gustavsson, 2012). This evidence supports theoretical perspectives (e.g., Demerouti et al., 2001) suggesting that burnout symptoms differ between individuals. Our findings indicated that students' sociodemographic characteristics can account for some of these differences (cf. *Hypothesis 2*). More specifically, we found statistically significant intercept variances for each student burnout symptom and slope variances for emotional exhaustion and cynicism but not for reduced professional efficacy (cf. Rudman & Gustavsson, 2012). That is, students significantly differed in their initial levels at T_1 on all student burnout factors and in their trajectories on emotional exhaustion and cynicism. In consideration of these findings, the examination of inter-individual differences in the temporal development of those symptoms thus seem rational (cf. Byrne and Crombie, 2003).

5.2. *Sociodemographic differences in temporal development of student burnout factors*

In the current longitudinal study, we examined whether gender, age, study progress, and academic major differences existed in the initial level and trajectory of each student burnout symptom. To our knowledge, this study provides the first empirical evidence concerning which groups of university students face an increased risk of burnout symptomatology both at the beginning of the semester and over its course.

5.2.1. *Gender differences*

Gender differences in the initial levels of emotional exhaustion and cynicism did not exist in our sample, but we found gender differences in the initial level of reduced professional efficacy. Compared to their male counterparts, our results indicated that female students entered the semester with less professional efficacy. Salmela-Aro and Read (2017) also identified that female students experienced a greater sense of inadequacy as a student than male students. Given that feelings of efficacy represent a significant predictor of academic achievement in higher education (Schneider & Preckel, 2017), promoting the efficacy beliefs of students—particularly female students—seems important. As Bresó et al. (2010) showed, promoting efficacy beliefs resulted in a decrease in student burnout, an increase in engagement, and enhanced performance.

Gender differences further existed in the trajectory of emotional exhaustion but not in the trajectories of cynicism and reduced professional efficacy. We identified that female students reported steeper increases in emotional exhaustion over time than male students. Generally, academic demands accompanied with stressors increase over the semester, and it could be that females struggled more than males to cope with these demands and were more prone to their negative effects (cf. Salmela-Aro & Read, 2017), particularly if they had insufficient resources such as self-esteem (cf. COR Theory; Hobfoll, 1989). Cross-sectional findings indicated that self-esteem tends to be significantly lower among females than males (Lawrence et al., 2006). The possible struggle with demands and a smaller pool of resources could, in turn, have contributed to the increase in exhaustion (e.g., tiredness and depletion) among females.

5.2.2. *Age and study progress differences*

Interestingly, we identified no age differences in the initial levels and trajectories of all student burnout symptoms (cf. Lee et al., 2020; Wang et al., 2019), but significant study progress differences in the initial levels of emotional exhaustion and reduced professional efficacy as well as the trajectory of reduced professional efficacy existed. Possibly, study progress reflects a more effective assessment of academic progress, which might be more related to burnout than biological age. Compared to lower-semester students, higher-semester students reported greater symptoms of emotional exhaustion and reduced professional efficacy at T_1 (cf. Salmela-Aro & Read, 2017). Yet, an increase in reduced professional efficacy over time occurred rather among lower-semester students. This could be due to a possible ceiling effect, meaning that higher-semester students may already have reached maximum levels of student burnout symptoms at T_1. It is also conceivable that at T_1 higher-semester students were more aware of the demanding academic requirements and challenges ahead, while lower-semester students may have experienced a "culture shock" and realized the harsh reality over time due to fewer experiences of what studying at university is like, thereby reporting a steeper increase in reduced professional efficacy as the semester progressed.

5.2.3. *Academic major differences*

Gusy et al. (2012) and Grützmacher et al. (2017) revealed that STEM students reported higher emotional exhaustion than non-STEM students. We did not find evidence of academic major differences in the initial levels and trajectories of emotional exhaustion, cynicism, and reduced professional efficacy. Yet, we identified that STEM students exhibited a greater increase in cynicism over time than economics/humanities/law students. An intriguing question is whether cynicism possibly triggers STEM students' decisions to drop out of university. According to Brockway et al. (2002), students with cynical attitudes (e.g., toward academic and institutional dimensions) can psychologically and physically withdraw from different facets of their university environment. Globally, high dropout rates of STEM students (up to 78 %; Chen and Soldner, 2013) are a source of concern, wherefore educational research invests laudable efforts to unravel, for example, the personal and contextual factors that trigger students' dropout decisions (Respondek et al., 2017; Xu, 2016).

5.3. Linkage of the temporal development of student burnout factors and university dropout intentions

Lastly, we evaluated the association between the temporal development of the student burnout symptoms and dropout intentions at T_3 (cf. *Research Question 3*). We unraveled that the initial levels and trajectories of each student burnout symptom positively and significantly related to dropout intentions at T_3. That is, students who reported higher emotional exhaustion, cynicism, and reduced professional efficacy at T_1, and greater increases in each of these symptoms over time, were more likely to report higher intentions to drop out from university at T_3 (cf. Mostert and Pienaar, 2020). Thus, put succinctly, student burnout symptoms seem to reflect risk factors for the formation of dropout intentions. Of the student burnout symptoms, cynicism appears to be the strongest determinant of those intentions. Cross-sectional studies identified a similar pattern (Cortes et al., 2014; Mostert and Pienaar, 2020). Turhan et al. (2022) recently suggested that cynicism perhaps develops last in the burnout process of students, possibly reflects the straw that breaks the camel's back, and ultimately triggers dropout decisions. With these findings in mind, we argue that theoretical models for student dropout (e.g., Bean and Metzner, 1985; Mashburn, 2000) should explicitly include student burnout symptoms— cynicism in particular—as meaningful predictors of dropout intentions, which are considered the strongest determinants of actual dropout decisions (cf. Bäulke et al., 2021).

5.4. Practical implications

5.4.1. Overarching guidelines for student burnout interventions

To date, overarching guidelines for the development and implementation of interventions against student burnout symptoms are nonexistent. However, existing theoretical models (e.g., Job Demands-Resources Model [JD-R]; Demerouti et al., 2001) and empirical findings illuminate several ideas for the design and timing of burnout interventions in the university context. A core tenet of the JD-R Model is that burnout symptoms can emanate because of an ongoing loss of resources. Empirical findings identified *teacher support* (reliability on teachers for help on study-related issues), *student support* (reliability on peers for accurate information and constructive feedback), and *developmental opportunities* (reliability on study programs for encouraging career chances and conveying relevant skills) as particularly important resources (Gusy et al., 2016; Lesener et al., 2020). Considering these findings, universities should aim to equip students with these resources by informing them about opportunities to receive teacher support and about how to provide support to their peers. In addition, university administrators could design recruiting materials that present an accurate description of the institution and study programs or offer online self-assessments that students can use to examine their fit to the programs (cf. Karst et al., 2017). These endeavors could serve to avoid students' unfulfilled expectations regarding possible developmental opportunities in their chosen programs (cf. Brockway et al., 2002; Grassinger, 2018; Karst et al., 2017).

Support offered by universities can be helpful in preventing burnout symptoms but is not sufficient on its own. We suppose that an interdisciplinary approach is essential to prevent and mitigate these multifaceted symptoms and the accompanying adverse consequences. This approach could involve the combined support of clinical psychologists, student counselors, lecturers, and university administrators tailored to the distinct student burnout symptoms. Clinical interventions are often offered outside of university contexts. When on-campus interventions are lacking and not integrable because of limited financial resources, then universities should at least provide students with information (e.g., on their university websites) on which counseling services or health centers to contact. Generally, we suggest offering preventive support from the beginning of the semester because our results and some previous empirical evidence (e.g., Kachel et al., 2020; Rudman & Gustavsson, 2012) indicated that burnout symptoms tend to increase linearly over one semester. In addition, we suggest paying particular attention to emotional exhaustion, as it seems to indicate the first developing burnout symptom or the first warning sign. Signs of emotional exhaustion, for example, could be extreme tiredness, absenteeism or late submission of study work because of the tiredness, and an overall reduced energy level. Further, we recommend providing particular support to female, STEM, and both higher- and lower-semester students in managing burnout symptoms, as the patterns of differences in such symptoms were generally less favorable for these student groups.

5.4.2. Guidelines for emotional exhaustion

Emotional exhaustion (i.e., tiredness, depletion, and energy loss) can develop due to demanding academic-related requirements and obligations. To counteract emotional exhaustion, clinical psychologists could apply interventions that previously showed effectiveness in reducing psychological distress and enhancing relaxation. In particular, these interventions include Cognitive-Behavioral Stress Management (CBSM; Gaab et al., 2003), Mindfulness-Based Stress Reduction (MBSR; Song & Lindquist, 2015), and exercise interventions (De Vries et al., 2016). In addition, student counselors and lecturers could equip students with resources, including, for example, metacognitive, motivational, and behavioral self-regulated learning strategies (Zimmerman, 1990) for coping with challenging academic demands and stressors. Besides, lectures must ensure that demands are balanced and can be mastered in appropriate time spans.

5.4.3. Guidelines for cynicism

Cynicism (i.e., cynical and detached attitudes toward one's studies) can emerge because of a mismatch between students' initial expectations of the university environment and program and their actual experiences (cf. Brockway et al., 2002; see also the Person-Environment Fit Model, Le et al., 2014). To counteract cynicism, university administrators must ensure that these expectations are met (cf. Grassinger, 2018; Karst et al., 2017). To this end, administrators could design and use recruiting materials that present an accurate and comprehensive description of the institution and study programs (Brockway et al., 2002). When cynical attitudes are present, clinical psychologists could offer students cognitive-behavioral therapy for counteracting negative thinking patterns, and student counselors could support students in the decision-making progress as to whether changing the academic major or dropping out from university may be an appropriate choice. In some cases, such choices can be beneficial for both the students and institutions concerned (cf. Schnettler et al., 2020).

5.4.4. Guidelines for reduced professional efficacy

Reduced professional efficacy is the negative self-evaluation component of student burnout and refers to a sense of being incompetent as a student. To counteract this symptom, clinical psychologists could apply Rational Emotive Behavior Therapy (REBT; Igbokwe et al., 2019). REBT targets the change and replacement of irrational thoughts and beliefs with rational ones by educating individuals on cognitive, behavioral, and emotive strategies. Lecturers could integrate interventions into their courses that are geared towards boosting students' self-efficacy beliefs. Research showed, for example, that delivering progress feedback (Duijnhouwer et al., 2010), assigning specific goals, and exposing students to vicarious learning experiences (Wang et al., 2004) led to significant improvements in their self-efficacy beliefs.

5.4.5. Implications for student dropout interventions

Given that our longitudinal results across one academic semester and prior longitudinal results across years (Rudman & Gustavsson, 2012) indicated that student burnout symptoms predict students' intentions to drop out from university, it is conceivable that effective and timely treatment of these symptoms will also help reduce these intentions. Given that student dropout decisions relate to various adverse consequences for different parties (e.g., students, institutions, and society; Williams et al., 2018), the prevention and mitigation of high dropout rates is imperative and of global concern (Bäulke et al., 2021). To date, the treatment of student burnout has played no salient role in endeavors to achieve lower dropout rates.

5.5. Limitations and directions for future research

Complementary to the strengths of our study, some limitations must also be noted. First, this study examined the temporal development of burnout symptoms within one academic semester in German undergraduate students, providing fundamental insights for the design and timing of intervention efforts for this student population in particular. To generalize our findings and broaden understanding of the burnout phenomenon further, it would be illuminating to examine whether a linear increase in burnout symptoms within semesters can also be found across other student populations (e.g., graduate students and students outside of Germany).

Second, our assessment of the concept of student burnout obliges improvement. Using the MBI-SS-KV, we focused on the emotional aspect of exhaustion but not on the physical and cognitive aspects that are considered integral elements in the Oldenburg Burnout Inventory for Students (OLBI-S; Reis et al., 2015). We encourage future research to address this limitation as the additional incorporation of these aspects (i.e., physical and cognitive) in the MBI-SS-KV can help obtain more thorough insights into the longitudinal developmental process of burnout in university students. After incorporation, future research should also test whether the modified student burnout measure demonstrates longitudinal measurement invariance—a critical prerequisite to arrive at conclusions about change over time (Widaman et al., 2010).

Third, our examination of inter-individual differences in the temporal development of each student burnout symptom also requires advancement. We evaluated whether specific sociodemographic differences (i.e., gender, age, academic semester, and academic major) existed in these temporal developments using an exploratory approach. We thereby aimed to provide insights into which student groups were particularly prone to burnout. To enrich these insights, we encourage researchers to apply theoretical models (e.g., COR Theory, Hobfoll, 1989; JD-R Model, Demerouti et al., 2001) when examining inter-individual differences in student burnout symptoms. Using the JD-R Model, for example, researchers can examine to what extent the resources and demands of students differ and to what extent these differences associate with those symptoms. For example, Salmela-Aro and Read (2017) and Turhan et al. (2022) more recently indicated that students with higher burnout symptoms concurrently experienced additional academic- and health-related consequences such as depression, loneliness, dysfunctional study behavior, and reduced study- and life satisfaction. These adverse experiences could possibly account for some inter-individual differences in the developmental trajectories of student burnout symptoms. These assumptions, however, require empirical validation.

6. Conclusion

Student life can be challenging (Stallman & Hurst, 2016) and constant exposure to challenges can trigger detrimental burnout symptoms, which are prevalent among university students. To prevent and mitigate these symptoms, students require timely support. To this end, research must be devoted to understanding the as yet understudied longitudinal development of these symptoms. We therefore longitudinally examined the temporal development of each separate student burnout symptom (i.e., emotional exhaustion, cynicism, and reduced professional efficacy) over one semester. The results pointed to a linear increase in all student burnout symptoms, indicating that these symptoms already increased as the semester progressed (cf. Rudman & Gustavsson, 2012). Sociodemographic differences existed in the temporal development of each of these symptoms. Female, STEM, and both higher- and lower- semester students were particularly susceptible to burnout symptoms (cf. Gusy et al., 2012; Salmela-Aro & Read, 2017). In addition, elevated levels of emotional exhaustion, cynicism, and reduced professional efficacy predicted intentions to drop out from university at T_3 (cf. Rudman & Gustavsson, 2012). Overall, this study (1) advanced the scientific understanding of the temporal development of student burnout symptoms, (2) identified student groups at higher risk for burnout symptoms, and (3) provided more in-depth insights into the role of these symptoms for students' intentions to drop out of university. By these means, this study features practical implications regarding the design and timing of burnout and dropout interventions.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

References

Aguayo, R., Cañadas, G. R., Assbaa-Kaddouri, L., Ramírez-Baena, L., & Ortega-Campos, E. (2019). A risk profile of sociodemographic factors in the onset of academic burnout syndrome in a sample of university students. *International Journal of Environmental Research and Public Health, 16*(5), 707. https://doi.org/10.3390/ijerph16050707

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). 10.1176/appi.books.9780890425596.

Amin, W. M., Al-Ali, M. H., Duaibis, R. B., Oweis, T., & Badran, D. H. (2009). Burnout among the clinical dental students in the Jordanian universities. *Journal of Clinical Medicine Research, 1*(4), 207–211. https://doi.org/10.4021/jocmr2009.09.1263

Asendorpf, J. B., Van De Schoot, R., Denissen, J. J., & Hutteman, R. (2014). Reducing bias due to systematic attrition in longitudinal studies: The benefits of multiple imputation. *International Journal of Behavioral Development, 38*(5), 453–460. https://doi.org/10.1177/0165025414542713

Auerbach, R. P., Mortier, P., Bruffaerts, R., Alonso, J., Benjet, C., Cuijpers, P., Demyttenaere, K., Ebert, D. D., Green, J. G., Hasking, P., Murray, E., Nock, M. K., Pinder-Amaker, S., Sampson, N. A., Stein, D. J., Vilagut, G., Zaslavsky, A. M., Kessler, R. C., & Collaborators, W.-H.-O.-W.-M.-H.-I.-C.-S. (2018). WHO World Mental Health Surveys International College Student Project: Prevalence and distribution of mental disorders. *Journal of Abnormal Psychology, 127*(7), 623–638. https://doi.org/10.1037/abn0000362

Bakker, A. B., & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of Managerial Psychology, 22*(3), 309–328. https://doi.org/10.1108/02683940710733115

Bäulke, L., Grunschel, C., & Dresel, M. (2021). Student dropout at university: A phase-orientated view on quitting studies and changing majors. *European Journal of Psychology of Education, 1–24*. https://doi.org/10.1007/s10212-021-00557-x

Bean, J. P., & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of Educational Research, 55*(4), 485–540. https://doi.org/10.3102/00346543055004485

Booij, A., Leuven, E., & Oosterbeeck, H. (2017). Ability peer effects in university: Evidence from a randomized experiment. *Review of Economic Studies, 84*, 547–578. https://doi.org/10.1093/restud/rdw045

Bollen, K. A., & Curran, P. J. (2006). *Latent curve models: A structural equation perspective* (Vol. 467). John Wiley & Sons.

Bresó, E., Schaufeli, W. B., & Salanova, M. (2010). Can a self-efficacy-based intervention decrease burnout, increase engagement, and enhance performance? A quasi-experimental study. *Higher Education, 61*(4), 339–355. https://doi.org/10.1007/S10734-010-9334-6

Brockway, J. H., Carlson, K. A., Jones, S. K., & Bryant, F. B. (2002). Development and validation of a scale for measuring cynical attitudes toward college. *Journal of Educational Psychology, 94*(1), 210–224. https://doi.org/10.1037/0022-0663.94.1.210

Browne, M. W., & Cudeck, R. (1998). Single sample crossvalidation indices for covariance structures. *Multivariate Behavioral Research, 24*(4), 445–455. https://doi.org/10.1207/s15327906mbr2404_4
Browning, M., Larson, L. R., Sharaievska, I., Rigolon, A., McAnirlin, O., Mullenbach, L., Cloutier, S., Vu, T. M., Thomsen, J., Reigner, N., Metcalf, E. C., D'Antonio, A., Helbich, M., Bratman, G. N., & Alvarez, H. O. (2021). Psychological impacts from COVID-19 among university students: Risk factors across seven states in the United States. *PLoS One1, 16*(1), e0245327.
Byrne, B. M., & Crombie, G. (2003). Modeling and testing change: An introduction to the latent growth curve model. *Understanding Statistics, 2*(3), 177–203. https://doi.org/10.1207/S15328031US0203_02
Cabras, C., & Mondo, M. (2018). Coping strategies, optimism, and life satisfaction among first-year university students in Italy: Gender and age differences. *Higher Education, 75*(4), 643–654. https://doi.org/10.1007/s10734-017-0161-x
Canning, E. A., Harackiewicz, J. M., Priniski, S. J., Hecht, C. A., Tibbetts, Y., & Hyde, J. S. (2018). Improving performance and retention in introductory biology with a utility-value intervention. *Journal of Educational Psychology, 110*, 834–849. https://doi.org/10.1037/edu0000244
Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*(3), 464–504. https://doi.org/10.1080/10705510701301834
Chen, X., & Soldner, M. (2013). *STEM Attrition: College Students' Paths Into and Out of STEM Fields* (NCES 2014-001). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.
Cheng, J., Zhao, Y. Y., Wang, J., & Sun, Y. H. (2020). Academic burnout and depression of Chinese medical students in the pre-clinical years: The buffering hypothesis of resilience and social support. *Psychology, health & medicine, 25*(9), 1094–1105.
Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5
Cohen, S., Murphy, M. L., & Prather, A. A. (2019). Ten surprising facts about stressful life events and disease risk. *Annual Review of Psychology, 70*, 577–597. https://doi.org/10.1146/annurev-psych-010418-102857
Corpus, J. H., Robinson, K. A., & Wormington, S. V. (2020). Trajectories of motivation and their academic correlates over the first year of college. *Contemporary Educational Psychology, 63*, Article 101907. https://doi.org/10.1016/j.cedpsych.2020.101907
Cortes, K., Mostert, K., & Els, C. (2014). Examining significant predictors of students' intention to drop out. *Journal of Psychology in Africa, 24*(2), 179–185. https://doi.org/10.1080/14330237.2014.903070
Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology, 86*(3), 499–512. https://doi.org/10.1037//0021-9010.86.3.499
Deng, Y., Hillygus, D. S., Reiter, J. P., Si, Y., & Zheng, S. (2013). Handling attrition in longitudinal studies: The case for refreshment samples. *Statistical Science, 28*(2), 238–256. https://doi.org/10.1214/13-STS414
De Vries, J. D., van Hooff, M. L., Geurts, S. A., & Kompier, M. A. (2016). Exercise as an intervention to reduce study-related fatigue among university students: a two-arm parallel randomized controlled trial. *PLoS ONE, 11*(3), Article e0152137. 10.1371/journal.pone.0152137.
Duijnhouwer, H., Prins, F. J., & Stokking, K. M. (2010). Progress feedback effects on students' writing mastery goal, self-efficacy beliefs, and performance. *Educational Research and Evaluation, 16*(1), 53–74. https://doi.org/10.1080/13803611003711393
Dyrbye, L. N., Shanafelt, T. D., Johnson, P. O., Johnson, L. A., Satele, D., & West, C. P. (2019). A cross-sectional study exploring the relationship between burnout, absenteeism, and job performance among American nurses. *BMC Nursing, 18*(1), 1–8. https://doi.org/10.1186/s12912-019-0382-7
Enders, C. K. (2010). *Applied Missing Data Analysis*. Guilford Press.
Field, A., Miles, J., & Field, Z. (2013). *Discovering tatistics using R*. London, UK: Sage Publications Ltd.
Fiorilli, C., Barni, D., Russo, C., Marchetti, V., Angelini, G., & Romano, L. (2022). Students' Burnout at University: The Role of Gender and Worker Status. *International Journal of Environmental Research and Public Health, 19*(18), 11341. https://doi.org/10.3390/ijerph191811341
Freedy, J. R., & Hobfoll, S. E. (1994). Stress inoculation for reduction of burnout: A conservation of resources approach. *Anxiety, Stress and Coping, 6*(4), 311–325. https://doi.org/10.1080/10615809408248805
Gaab, J., Blättler, N., Menzi, T., Pabst, B., Stoyer, S., & Ehlert, U. (2003). Randomized controlled evaluation of the effects of cognitive–behavioral stress management on cortisol responses to acute stress in healthy subjects. *Psychoneuroendocrinology, 28*(6), 767–779. https://doi.org/10.1016/S0306-4530(02)00069-0
Galán, F., Ríos-Santos, J. V., Polo, J., Rios-Carrasco, B., & Bullón, P. (2014). Burnout, depression and suicidal ideation in dental students. *Medicina Oral, Patologia Oral, Cirugia Bucal, 19*(3), e206.
Galán, F., Sanmartín, A., Polo, J., & Giner, L. (2011). Burnout risk in medical students in Spain using the Maslach Burnout Inventory-Student Survey. *International Archives of Occupational and Environmental Health, 84*(4), 453–459. https://doi.org/10.1007/s00420-011-0623-x
Gansemer-Topf, A. M., Kollasch, A., & Sun, J. (2017). A house divided? Examining persistence for on-campus STEM and non-STEM students. *Journal of College Student Retention: Research, Theory & Practice, 19*(2), 199–223. https://doi.org/10.1177/1521025115611671
Golembiewski, R. T. (1986). The epidemiology of progressive burnout: A primer. *Journal of Health and Human Resources Administration*, 16–37. http://www.jstor.org/stable/25780258.
Grassinger, R. (2018). Nicht erfüllte Erfolgserwartungen sowie nicht erfüllte Studienwerte und ihre Bedeutung für die Veränderung der Lern-und Leistungsmotivation, das emotionale Erleben und die Intention zum Studienabbruch im ersten Semester. *ZeHf–Zeitschrift für empirische Hochschulforschung, 2*(1), 7–8. https://doi.org/10.3224/zehf.v2i1.02
Grützmacher, J., Gusy, B., Lesener, T., Sudheimer, S., & Willige, J. (2017). Gesundheit Studierender in Deutschland 2017. Ein Kooperationsprojekt zwischen dem Deutschen Zentrum für Hochschul- und Wissenschaftsforschung, der Freien Universität Berlin und der Techniker Krankenkasse. https://www.fachportal-paedagogik.de/literatur/vollanzeige.html?FId=1149030#vollanzeige.
Gusy, B., Lohmann, K., & Marcus, K. (2012). Sind Bachelor-/Masterstudierende stärker ausgebrannt? *Prävention und Gesundheitsförderung, 7*(4), 237–245. https://doi.org/10.1007/s11553-012-0358-x
Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44*(3), 513–524. https://doi.org/10.1037/0003-066X.44.3.513
Hoyle, R. H. (1995). The structural equation modeling approach: Basic concepts and fundamental issues. In R. H. Hoyle (Ed.), Structural equation modeling: *Concepts, issues, and applications* (pp. 1–15). Sage.Igbokwe, U. L., Onyechi, K. C., Ogbonna, C. S., Eseadi, C., Onwuegbuchulam, A. C., Nwajiuba, C. A., Ugodulunwa, C. C., Eze, A., Omaeze, K., Patrick, C. P., Ekechukwu, L. E., Egbe, C. I., Nnachi, R. A.& Anyaegbunam, E. N. (2019). Rational emotive intervention for stress management among English education undergraduates: implications for school curriculum innovation. *Medicine, 98*(40), e17452. 10.1097/MD.0000000000017452.
Igbokwe, U. L., Nwokenna, E. N., Eseadi, C., Ogbonna, C. S., Nnadi, E. M., Ololo, K. O., Enyoghasim, O. M., Otu, O. A., Uma, K. E., Onuora, T. N., Onwube, O., & Ogbuagu, A. R. (2019). Intervention for burnout among English education undergraduates: Implications for curriculum innovation. *Medicine, 98*(26). https://doi.org/10.1097/MD.0000000000016219
Jackson, E. R., Shanafelt, T. D., Hasan, O., Satele, D. V., & Dyrbye, L. N. (2016). Burnout and alcohol abuse/dependence among US medical students. *Academic Medicine, 91*(9), 1251–1256. https://doi.org/10.1097/ACM.0000000000001138
Kachel, T., Huber, A., Strecker, C., Höge, T., & Höfer, S. (2020). Development of cynicism in medical students: Exploring the role of signature character strengths and well-being. *Frontiers in Psychology, 11*, 1–16. https://doi.org/10.3389/fpsyg.2020.00328
Karst, K., Ertelt, B. J., Frey, A., & Dickhäuser, O. (2017). Academic orientation using self-assessments: Attitude change towards subject of study while conducting an online-self-assessment. *Journal for Educational Research. Online, 9*(2), 205–227. https://doi.org/10.25656/01:14935
Kaggwa, M. M., Kajjimu, J., Sserunkuma, J., Najjuka, S. M., Atim, L. M., Olum, R., Tagg, A., & Bongomin, F. (2021). Prevalence of burnout among university students in low-and middle-income countries: A systematic review and meta-analysis. *PLoS One1, 16*(8), e0256402.
Kang, H. K., Rhodes, C., Rivers, E., Thornton, C. P., & Rodney, T. (2021). Prevalence of mental health disorders among undergraduate university students in the United States: A review. *Journal of Psychosocial Nursing and Mental Health Services, 59*(2), 17–24. https://doi.org/10.3928/02793695-20201104-03
Kniffin, K. M., Narayanan, J., Anseel, F., Antonakis, J., Ashford, S. P., Bakker, A. B., Bamberger, P., Bapuji, H., Bhave, D. P., Choi, V. K., Creary, S. J., Demerouti, E., Flynn, F. J., Gelfand, M. J., Greer, L. L., Johns, G., Kesebir, S., Klein, P. G., Lee, S. Y., Ozcelik, H., Petriglieri, J. L., Rothbard, N. P., Rudolph, C. W., Shaw, J. D., Sirola, N., Wanberg, C. R., Whillans, A., Wilmot, M. P., & van Vugt, M. (2021). COVID-19 and the workplace: Implications, issues, and insights for future research and action. *American Psychologist, 76*(1), 63–77. https://doi.org/10.1037/amp0000716
Kristanto, T., Chen, W. S., & Thoo, Y. Y. (2016). Academic burnout and eating disorder among students in Monash University Malaysia. *Eating Behaviors, 22*, 96–100. https://doi.org/10.1016/j.eatbeh.2016.03.029
Lawrence, J., Ashford, K., & Dent, P. (2006). Gender differences in coping strategies of undergraduate students and their impact on self-esteem and attainment. *Active Learning in Higher Education, 7*(3), 273–281. https://doi.org/10.1177/1469787406069058
Le, H., Robbins, S. B., & Westrick, P. (2014). Predicting student enrollment and persistence in college STEM fields using an expanded P-E fit framework: A large-scale multilevel study. *Journal of Applied Psychology, 99*(5), 915–947. https://doi.org/10.1037/a0035998
Lee, K. P., Yeung, N., Wong, C., Yip, B., Luk, L. H., & Wong, S. (2020). Prevalence of medical students' burnout and its associated demographics and lifestyle factors in Hong Kong. *PLoS One1, 15*(7), e0235154.
Leiter, M. P., & Maslach, C. (1988). The impact of interpersonal environment on burnout and organizational commitment. *Journal of Organizational Behavior, 9*(4), 297–308. https://doi.org/10.1002/job.4030090402
Lesener, T., Pleiss, L. S., Gusy, B., & Wolter, C. (2020). The study demands-resources framework: An empirical introduction. *International Journal of Environmental Research and Public Health, 17*(14), 5183. https://doi.org/10.3390/ijerph17145183
Madigan, D. J., & Curran, T. (2020). Does burnout affect academic achievement? A meta-analysis of over 100,000 students. *Educational Psychology Review, 1–19*. https://doi.org/10.1007/s10648-020-09533-1
Mashburn, A. J. (2000). A psychological process of college student dropout. *Journal of College Student Retention: Research, Theory & Practice, 2*(3), 173–190. https://doi.org/10.2190/U2QB-52J9-GHGP-6LEE
Meda, N., Pardini, S., Slongo, I., Bodini, L., Zordan, M. A., Rigobello, P., … Novara, C. (2021). Students' mental health problems before, during, and after COVID-19 lockdown in Italy. *Journal of Psychiatric Research, 134*, 69–77. https://doi.org/10.1016/j.jpsychires.2020.12.045

Moneta, G. B. (2011). Need for achievement, burnout, and intention to leave: Testing an occupational model in educational settings. *Personality and Individual Differences, 50* (2), 274–278. https://doi.org/10.1016/j.paid.2010.10.002
Mostert, K., & Pienaar, J. (2020). The moderating effect of social support on the relationship between burnout, intention to drop out, and satisfaction with studies of first-year university students. *Journal of Psychology in Africa, 30*(3), 197–202. https://doi.org/10.1080/14330237.2020.1767928
Muthén, L. K., & Muthén, B. O. (1998–2017). Mplus User's Guide. Muthén & Muthén.
Neugebauer, M., Heublein, U., & Daniel, A. (2019). Studienabbruch in Deutschland: Ausmaß, Ursachen, Folgen, Präventionsmöglichkeiten. *Zeitschrift für Erziehungswissenschaft, 22*(5), 1025–1046. https://doi.org/10.1007/s11618-019-00904-1
Nteveros, A., Kyprianou, M., Artemiadis, A., Charalampous, A., Christoforaki, K., Cheilidis, S., Germanos, O., Bargiotas, P., Chatzittofis, A., & Zis, P. (2020). Burnout among medical students in Cyprus: A cross-sectional study. *PLoS ONE*, *15*(11), Article e0241335. 10.1371/journal.pone.0241335.
Paro, H. B. M. S., Silveira, P. S. P., Perotta, B., Gannam, S., Enns, S. C., Giaxa, R. R. B., Bonito, R. F., Martins, M. A., & Tempski, P. Z. (2014). Empathy among medical students: Is there a relation with quality of life and burnout? *PLoS ONE, 9*(4), Article e94133. 10.1371/journal.pone.0094133.
Portoghese, I., Leiter, M. P., Maslach, C., Galletta, M., Porru, F., D'Aloja, E., Finco, G., & Campagna, M. (2018). Measuring burnout among university students: Factorial validity, invariance, and latent profiles of the Italian version of the Maslach Burnout Inventory Student Survey (MBI-SS). *Frontiers in Psychology, 9*, 2105. https://doi.org/10.3389/fpsyg.2018.02105
Reis, D., Xanthopoulou, D., & Tsaousis, I. (2015). Measuring job and academic burnout with the Oldenburg Burnout Inventory (OLBI): Factorial invariance across samples and countries. *Burnout Research, 2*(1), 8–18. https://doi.org/10.1016/j.burn.2014.11.001
Respondek, L., Seufert, T., Stupnisky, R., & Nett, U. E. (2017). Perceived academic control and academic emotions predict undergraduate university student success: Examining effects on dropout intention and achievement. *Frontiers in Psychology, 8*, 243. https://doi.org/10.3389/fpsyg.2017.00243
Ríos-Risquez, M. I., García-Izquierdo, M., Sabuco-Tebar, E. D. L.Á., Carrillo-Garcia, C., & Solano-Ruiz, C. (2018). Connections between academic burnout, resilience, and psychological well-being in nursing students: A longitudinal study. *Journal of Advanced Nursing, 74*(12), 2777–2784. https://doi.org/10.1111/jan.13794
Robins, T. G., Roberts, R. M., & Sarris, A. (2017). The role of student burnout in predicting future burnout: Exploring the transition from university to the workplace. *Higher Education Research & Development, 37*(1), 115–130. https://doi.org/10.1080/07294360.2017.1344827
Robinson, K. A., Lee, Y.-K., Bovee, E. A., Perez, T., Walton, S. P., Briedis, D., & Linnenbrink-Garcia, L. (2019). Motivation in transition: Development and roles of expectancy, task values, and costs in early college engineering. *Journal of Educational Psychology, 111*(6), 1081–1102. https://doi.org/10.1037/edu0000331
Rotenstein, L. S., Ramos, M. A., Torre, M., Segal, J. B., Peluso, M. J., Guille, C., Sen, S., & Mata, D. A. (2016). Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: A systematic review and meta-analysis. *Journal of the American Medical Association, 316*(21), 2214–2236. https://doi.org/10.1001/jama.2016.17324
Rudman, A., & Gustavsson, J. P. (2012). Burnout during nursing education predicts lower occupational preparedness and future clinical performance: A longitudinal study. *International Journal of Nursing Studies, 49*(8), 988–1001. https://doi.org/10.1016/j.ijnurstu.2012.03.010
Salmela-Aro, K., & Read, S. (2017). Study engagement and burnout profiles among Finnish higher education students. *Burnout Research, 7*, 21–28. https://doi.org/10.1016/j.burn.2017.11.001
Salmela-Aro, K., Upadyaya, K., Ronkainen, I., & Hietajärvi, L. (2022). Study burnout and engagement during COVID-19 among university students: The role of demands, resources, and psychological needs. *Journal of Happiness Studies, 23*(6), 2685–2702. https://doi.org/10.1007/s10902-022-00518-1
Schaufeli, W. B., Martínez, I. M., Pinto, A. M., Salanova, M., & Bakker, A. B. (2002). Burnout and engagement in university students: A cross-national study. *Journal of Cross-Cultural Psychology, 33*(5), 464–481. https://doi.org/10.1177/0022022102033005003
Schneider, M., & Preckel, F. (2017). Variables associated with achievement in higher education: A systematic review of meta-analyses. *Psychological Bulletin, 143*(6), 565–600. https://doi.org/10.1037/bul0000098
Schnepf, S. V. (2017). How do tertiary dropouts fare in the labour market? A comparison between EU countries. *Higher Education Quarterly, 71*(1), 75–96. https://doi.org/10.1111/hequ.12112
Schnettler, T., Bobe, J., Scheunemann, A., Fries, S., & Grunschel, C. (2020). Is it still worth it? Applying expectancy-value theory to investigate the intraindividual motivational process of forming intentions to drop out from university. *Motivation and Emotion, 44*, 491–507. https://doi.org/10.1007/s11031-020-09822-w
Song, Y., & Lindquist, R. (2015). Effects of mindfulness-based stress reduction on depression, anxiety, stress and mindfulness in Korean nursing students. *Nurse Education Today, 35*(1), 86–90. https://doi.org/10.1016/j.nedt.2014.06.010
Stallman, H. M. (2008). Prevalence of psychological distress in university students: Implications for service delivery. *Australian Journal of General Practice, 37*(8), 673–677.
Stallman, H. M., & Hurst, C. P. (2016). The university stress scale: Measuring domains and extent of stress in university students. *Australian Psychologist, 51*(2), 128–134. https://doi.org/10.1111/ap.12127
Thomas, S. L. (2000). Ties that bind: A social network approach to understanding student integration and persistence. *The Journal of Higher Education, 71*(5), 591–615. https://doi.org/10.1080/00221546.2000.11778854
Turhan, D., Scheunemann, A., Schnettler, T., Bäulke, L., Thies, D. O., Dresel, M., Fries, S., Leutner, D., Wirth, J., & Grunschel, C. (2021). Psychometric properties of the German short version of the Maslach Burnout Inventory – Student Survey. *European Journal of Health Psychology, 28*(2), 45–58. https://doi.org/10.1027/2512-8442/a000067
Turhan, D., Schnettler, T., Scheunemann, A., Gadosey, C. K., Kegel, L. S., Bäulke, L., Thies, D. O., Thomas, L., Buhlmann, U., Dresel, M., Fries, S., Leutner, D., Wirth, J., & Grunschel, C. (2022). University students' profiles of burnout symptoms amid the COVID-19 pandemic in Germany and their relation to concurrent study behavior and experiences. *International Journal of Educational Research, 116*, Article 102081. https://doi.org/10.1016/j.ijer.2022.102081
UNESCO Institute for Statistics (2018). Higher Education. https://uis.unesco.org/en/topic/higher-education.
van Klaveren, C., Kooiman, K., Cornelisz, I., & Meeter, M. (2019). The higher education enrollment decision: Feedback on expected study success and updating behavior. *Journal of Research on Educational Effectiveness, 12*(1), 67–89. https://doi.org/10.1080/19345747.2018.1496501
Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education, 36*(3), 231–250. https://doi.org/10.1080/15391523.2004.10782414
Wang, Q., Wang, L., Shi, M., Li, X., Liu, R., Liu, J., Zhu, M., & Wu, H. (2019). Empathy, burnout, life satisfaction, correlations and associated socio-demographic factors among Chinese undergraduate medical students: An exploratory cross-sectional study. *BMC Medical Education, 19*(1), 341. https://doi.org/10.1186/s12909-019-1788-3
Weston, R., Gore, P. A., Jr., Chan, F., & Catalano, D. (2008). An introduction to using structural equation models in rehabilitation psychology. *Rehabilitation Psychology, 53* (3), 340–356. https://doi.org/10.1037/a0013039
Widaman, K. F., Ferrer, E., & Conger, R. D. (2010). Factorial invariance within longitudinal structural equation models: Measuring the same construct across time. *Child Development Perspectives, 4*(1), 10–18. https://doi.org/10.1111/j.1750-8606.2009.00110.x
Widaman, K. F., & Reise, S. P. (1997). Exploring the measurement invariance of psychological instruments: Applications in the substance use domain. In K. J. Bryant, M. Windle, & S. G. West (Eds.), *The science of prevention: Methodological advances from alcohol and substance abuse research* (pp. 281–324). American Psychological Assocation. https://doi.org/10.1037/10222-009.
Williams, C. J., Dziurawiec, S., & Heritage, B. (2018). More pain than gain: Effort–reward imbalance, burnout, and withdrawal intentions within a university student population. *Journal of Educational Psychology, 110*(3), 378–394. https://doi.org/10.1037/edu0000212
Wörfel, F., Gusy, B., Lohman, K., & Kleiber, D. (2015). Validation of the German Short Version of the Maslach-Burnout-Inventory for Students (MBI-SS KV). *Zeitschrift für Gesundheitspsychologie, 23*(4), 193–198. https://doi.org/10.1026/0943-8149/a000146
World Health Organization. (2019). *International statistical classification of diseases and related health problems* (11th ed.). https://icd.who.int/.
Worly, B., Verbeck, N., Walker, C., & Clinchot, D. M. (2019). Burnout, perceived stress, and empathic concern: Differences in female and male Millennial medical students. *Psychology, Health & Medicine, 24*(4), 429–438. https://doi.org/10.1080/13548506.2018.1529329
Xu, Y. J. (2016). Attention to retention: Exploring and addressing the needs of college students in STEM majors. *Journal of Education and Training Studies*, *4*(2), 67–76. 10.11114/jets.v4i2.1147.
Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist, 25*(1), 3–17. https://doi.org/10.1207/s15326985ep2501_2

Further reading

Stratton, L. S., O'Toole, D. M., & Wetzel, J. N. (2005). Comparing First Term and First Year College Attrition. *Virginia Economic Journal, 10*, 29–44.