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COVID-19-induced academic stress and its impact on life satisfaction and optimism. A panel study of Swedish university students between 2020 and 2022

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ABSTRACT

In this article, we analyse the level of and development in students' academic stress due to the COVID-19 pandemic. We devote particular attention to students that first entered university in 2020, 'the COVID cohort', who had fewer opportunities to integrate in ways that theoretically should mitigate the impact of pandemic-induced disruption to their studies. Using four waves of data, collected 2020–2022, we find evidence of both pandemic and cohort effects among Swedish university students ($N = 3138$). During the pandemic's first year academic stress due to COVID-19 increased regardless of pre-pandemic university experience. The stress, in turn, negatively impacted students' life satisfaction, a factor theoretically linked to key student outcomes like persistence and academic performance but had limited effect on students' long-term optimism. The COVID cohort expressed higher levels of academic stress and experienced a greater drop in life satisfaction compared to the most senior students (3 years or more), but largely overlapped with students with some university experience (1–2 years). These group differences persisted in spring 2022. Finally, we found that the higher levels of pandemic-induced academic stress in the COVID cohort were mitigated by experiences that foster academic and social integration, specifically by teacher support and social cohesion.

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Academic stress; life satisfaction; student well-being; optimism; COVID-19

The COVID-19 pandemic introduced unprecedented changes to university students' lives by disrupting expectations, experiences, and outcomes (Aucejo et al. 2020). As universities worldwide closed their campuses to students, the pandemic had a transformative effect on the way students experience higher education by making online courses a reality for most (OECD 2021). Although distance education as a mode of instruction has increased in recent decades (Allen and Seaman 2013; Gaebel et al. 2014; Ortagus 2017), its near universal adoption during the pandemic should be considered a public health intervention rather than a pedagogical practice. Nevertheless, this broad shift in

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response to COVID-19 should have implications for students' academic and social integration (Deil-Amen 2011; Rovai 2003), factors that are important for academic performance and persistence in institutions of higher education (Tinto [1987] 1993; Hadjar, Haas, and Gewinner 2022) as well as stress (Adams, Meyers, and Beidas 2016; Wilcox and Winn 2006).

While it is still too soon to make strong claims about the impact of COVID-19 on longer term outcomes like retention or attrition, we can examine to what extent known factors that put students at risk for such negative outcomes are present. Thus, in this study, we focus on pandemic-induced academic stress. Academic-related stress has previously been tied to poor mental and physical health, academic performance, as well as longer-term consequences for students in higher education (Pascoe, Hetrick, and Parker 2020). While university students early during the pandemic reported an increase in workload, concerns about academic progress, and higher levels of stress and worry (Browning et al. 2022; Matos Fialho et al. 2021; Chaturvedi, Vishwakarma, and Singh 2021), little is known about how student experiences developed as the pandemic unfolded and online learning continued. Moreover, little is known about potential scarring effects as students gradually returned to campus when the pandemic abated.

Therefore, in this article, we examine students' level of worry about their academic performance as an expression of academic-related stress (Putwain 2007), and how it changed during two years of pandemic-induced distance education. First, we investigate within-student changes in COVID-19-induced academic stress between autumn 2020 and spring 2022. Given the importance the theoretical literature places on social and academic integration (Tinto [1987] 1993), we pay special attention to students that matriculated (i.e. first enrolled at a specific university) in 2020. We call this group 'the COVID cohort'. Importantly, these students have no prior experiences in higher education. We examine differences in the level of and changes in academic stress over time as well as the impact of theoretically important factors like teacher support, student interaction and social cohesion (Hurtado 2007). Second, we analyse the consequences of academic-related stress on life satisfaction and expectations about the future, factors theoretically linked to student outcomes like persistence and academic performance (Bean and Metzner 1985; Rovai 2003). To carry out the analyses, we use four waves of panel data collected 2020–2022 at a large university in northern Sweden ($N = 3138$). Our results contribute to the literature in higher education on the academic and social integration of university students and to the cross-disciplinary literature on the impact of COVID-19 on student experiences.

Explaining variation in academic-related stress: the role of student integration

While we do not analyse the effect of distance education per se,[1] it is impossible to think about the consequences of the pandemic for university students without taking it into account. Pre-pandemic research shows that online courses are associated with higher attrition rates (Frydenberg 2007), and that first-year students are most at risk of withdrawing from a course (Cochran et al. 2014). Given the difficulties associated with student engagement in online learning (Dixson 2010), we expect a university-wide shift to that mode of instruction to have negative consequences for students (Alpert, Couch, and Harmon 2016; Bettinger et al. 2017), and especially for students in their

first year. Theoretically this is because distance education limits students' academic and social integration in higher education institutions (Rovai 2003), something which has been found to predict both higher levels of stress and risk of attrition (Piepenburg and Beckmann 2022; Naylor, Baik, and Arkoudis 2018; Adams, Meyers, and Beidas 2016). Thus, in this paper, we consider distance education an intermediate factor or mechanism, that helps us understand the relationship between the COVID-19 pandemic and student experiences.

While students' ability to adapt online learning is dependent on a complex set of socio-emotional competencies and self-regulatory practices (Flores et al. 2022), outcomes for students implicate both student and institutional characteristics. According to Tinto's classical model of student attrition ([1987] 1993), the match between characteristics of the student and the higher education institution is of critical importance, as it plays out in a dynamic, interactive process that affects student persistence and success. By this account, student characteristics, which include goals, expectations, and subjective experiences like stress, are influenced by interactions within the formal and informal academic and social structures of an institution. Student outcomes, in this sense, depend both on the extent to which a student actively engages in learning and the extent to which an institution itself engages the student (Wolf-Wendel, Ward, and Kinzie 2009).

Central to Tinto's model is the academic and social integration of students, with the main insight being that experiences that promote integration should strengthen a student's commitment to the institution and their goal of graduating (Tinto 1975). Therefore, while educational practices such as collaborative work should build a sense of community and make academic success more likely (Tinto [1987] 1993), insufficient interactions with faculty and students, a likely consequence of distance education, should put students at risk for stress and eventually dropout. Moreover, this risk is likely to vary depending on student characteristics associated with different degrees of social and academic integration. In a recent test of Tinto's model, differences in dropout intentions between different student groups were largely explained by differences in social and academic integration (Hadjar, Haas, and Gewinner 2022). The degree of integration, in turn, was positively related to perceived institutional support, which suggests that institutions of higher education may prevent negative student outcomes by providing support.

In the current study, we expect the COVID cohort, who compared to other cohorts had limited opportunity to develop a sense of congruence with the university, to experience higher levels of pandemic-induced academic stress. The first year in higher education is an important year of transition (Brooman and Darwent 2014). How students fare when it comes to adjusting to the demands of higher education depends on social and academic integration, largely facilitated by interactions with and perceived support by university staff and peers (Krause 2001; Hadjar, Haas, and Gewinner 2022; Resch, Alnahdi, and Schwab 2022). Thus, we expect experiences of teacher support, student interaction, and social cohesion to reduce pandemic-induced academic stress among students in general, but also in particular among students in the COVID cohort.

Consequences of pandemic-induced academic stress

As for consequences of pandemic-induced academic stress, we focus on students' life satisfaction and expectations for the future. Recent research found that changes in the mode

of instruction due to the pandemic led to stress among nearly half of a sample of German university students. Moreover, this stress significantly increased symptoms of depression (Matos Fialho et al. 2021). Early during the pandemic, studies found study-related worries to predict higher levels of depressive symptoms (Calandri et al. 2021) and lower levels of student well-being, via perceived lack of university support (Plakhotnik et al. 2021). Research prior to the pandemic shows that high levels of stress have negative consequences for students' mental health, depression, and anxiety (Pascoe, Hetrick, and Parker 2020), and research on the impact of worrying also reports negative consequences for health-related outcomes (e.g. Brosschot, Gerin, and Thayer 2006).

Further, research has found academic stress during COVID-19 to be related to a less optimistic view of the future (Syropoulos et al. 2021), something which previously has been tied to heightened risk of academic burn-out and poor academic performance (Vizoso, Arias-Gundín, and Rodríguez 2019). Optimism is key to cope with uncertainty and crisis (Carbone and Echols 2017; Colby and Shifren 2013), also during the COVID-19 pandemic (Yang, Tu, and Dai 2020), which underscores the importance of studying how student optimism developed during 2020–2022 in response to pandemic-induced academic stress. Based on these previous studies, we expect that pandemic-induced academic stress will have negative implications for life satisfaction and expectations about the future. However, we note that there also are studies showing that worrying can increase one's motivation to overcome problems (e.g. Sweeny and Dooley 2017), which emphasizes the need to examine the consequences of academic-related stress in the context of the pandemic.

In summary, this study features two sets of analyses. In the first set, we examine the level of and development in students' academic stress due to the COVID-19 pandemic. We begin by examining within-student changes in pandemic-induced academic stress. We devote particular attention to 'the COVID cohort', whose lack of previous experience at the university prior to autumn 2020 makes its members theoretically more vulnerable to stress from pandemic-induced disruptions to their academic experiences. By comparing the COVID cohort to more senior students and also to new students matriculating in autumn of 2021, we are able to distinguish pandemic effects from more typical student trajectories. Given the theoretical emphasis on social and academic integration we also examine the impact of teacher support, student interaction and social cohesion on pandemic-induced academic stress. In a second set of analyses, we investigate how changes in pandemic-induced academic stress are related to factors theoretically linked to student persistence and performance, specifically life satisfaction and expectations about the future.

Setting and timeline

Our sample comes from a large university in northern Sweden. Due to government recommendations regarding social distancing and limits on room capacity in public settings, the university closed its campus and moved all teaching online on the 18th of March 2020. The combination of low infection rates during the summer and the goal of having students back on campus led to a reopening prior to autumn semester 2020. This decision came with the caveat that courses could be held on campus only if it were possible to comply with recommendations regarding physical distancing. This was, in practice, impossible, and therefore the vast majority of courses began or

quickly moved online. With rates of infection increasing throughout autumn, virtually all courses moved online by the 10th of November and remained so throughout spring 2021. This pattern repeated in autumn 2021, when a cautious reopening of campus again was soon reversed by the administration in response to high infection rates. After Swedish authorities lifted most COVID-19 restrictions on 9 February 2022, there was a general return to campus. Analyses of mobile network data show that the campus activity at Swedish universities returned to pre-pandemic levels by the end of March 2022 (Lundstedt 2022).

Data and methods

Sample

For the analyses that follow, we rely on the first four waves of a panel survey of university students at a large Swedish university. We administered wave 1 of the survey in October/November of 2020, wave 2 in March/April of 2021, wave 3 in October/November of 2021, and wave 4 in March/April of 2022. Designed as a general social survey to aid in the investigation of the relationship between university education and attitudinal change, the survey includes a wide range of questions about society, social issues, as well as important current events. As a part of these themes, we included questions about the ongoing pandemic. We also ask questions about students' educational experiences. The web-based survey is administered once every semester using the software Limesurvey. Our goal is to survey students who matriculated in autumn 2020 throughout their undergraduate experience, but we also include other undergraduates who began their studies prior to 2020 as well as students who matriculated in 2021.

To recruit participants, we targeted the total population of students at the university in focus. In autumn of 2020, we emailed all individuals who were registered students by a certain date, which was approximately two weeks into the autumn semester. This email contained information about the survey, which we described as an effort to learn what university students think about societal issues as well as their university experiences. The email contained a link to an individual but anonymous survey. A total of 22,031 emails were sent, but we do not know how many students actually received our invitation, due to, for example, early dropouts, late joiners, and incorrect or infrequently checked email addresses. We also made special efforts to recruit newly matriculated students by visiting classrooms of courses predominately populated by first-year students. These were mainly digital classroom visits via Zoom. In these visits we shared the same information that was in the email, encouraged them to participate, and asked them to check their inboxes and spam folders for the invitation. Ultimately, wave 1 included 3138 respondents, of which 1014 were new students (i.e. the COVID cohort).

In autumn of 2021, we followed the same steps described above to recruit newly matriculated students into the panel. We added 1098 students (i.e. the 2021 cohort). All students who participated in wave 1 and/or wave 2 during the previous academic year also received email invitations to continue their participation in waves 3 and 4 during the 2021–2022 academic year. For an overview of the sample by cohort and wave, see Table A1 in the Appendix. Descriptive statistics, also found in Table A1, show that our sample is largely representative of the university student population in terms of

gender but were slightly older that the average student. Therefore, all our models control for age.

For our analyses, we divided the 2020 sample into three categories based on the question: 'Have you studied at any college/university before the current semester?'. The COVID cohort ($n = 1014$) included students who matriculated either spring 2020 or autumn 2020. The other two categories were students who, by autumn 2020, had 1–2 years of university studies ($n = 1142$) and 3 or more years of university studies ($n = 982$). We note that attrition rates are not trivial: 50% between wave 1 and wave 2 and 80% between wave 1 and wave 4. Of course, part of this is due to students graduating from university or leaving for other reasons, but part of it is due to students leaving the panel. Nevertheless, within-cohort comparisons between students who leave and remain in the sample show no significant differences in wave 1 scores on our key indicators: pandemic-induced stress ($M = 3.82$, SE = 0.07 vs. $M = 3.87$, SE = 0.13); life satisfaction ($M = 6.76$, SE = 0.04 vs. $M = 6.66$, SE = 0.08); and optimism about the future ($M = 6.53$, SE = 0.03 vs. $M = 6.42$, SE = 0.07). Thus, we find it unlikely that attrition accounts for the trends we observe in the analyses. Importantly, results are the same when analysing a restricted sample consisting only of students still in the sample at wave 4.

Measures

We operationalize academic-related stress as worry about studies related to COVID-19. We view worry as the cognitive component of anxiety including thoughts about future events with potential negative consequences (Borkovec 1994). Our dependent variable reflects domain-specific worry, in this case pandemic-induced worry related to studies. To capture this, we asked respondents: 'Thinking about the coronavirus pandemic, on a scale from 0 to 10, how worried are you about each of the following? (0 = Not at all worried, 10 = Extremely worried)'. For the dependent variable, we used the item asking specifically about 'Your studies'. The other two items, which are included as controls, refer to 'Your personal finances' and 'Getting infected with the virus'. While scales such as the Penn State Worry Questionnaire are generally used to measure global worry, single indicators are often considered sufficient to tap domain-specific worry (Gogol et al. 2014; Camacho et al. 2021). This is further supported by how different indicators of academic stress emerge as highly correlated (Bedewy and Gabriel 2015).

To measure life satisfaction, students were asked 'All things considered, how satisfied with life are you as a whole nowadays? (0–10, 0 = Extremely dissatisfied, 10 = Extremely satisfied)'. This question is arguably the dominant measure of subjective well-being and is included in most large general surveys (e.g. the European Social Survey 2002–2022). This single item has been shown to work as well as various multi-item scales of subjective well-being (Cheung and Lucas 2014). To measure expectations about the future we asked the students: 'In society, there are people who are at the top (in terms of job, income, status) and people who are at the bottom. Where on this scale do you believe you will be in ten years? (0–10, 0 = Bottom of society, 10 = Top of society)'.

In terms of student experiences that could mitigate academic stress, we focus on three factors: perceived teacher support, sense of community in class and time spent with university friends. We measure teacher support and sense of community by asking students to what extent they agree or disagree with the following statements: 'My teachers are

engaged' and 'In my course/program, we have a good sense of community', with five response categories ranging from 'Strongly disagree' to 'Strongly agree'. Both questions were only asked at wave 2 (spring 2021). Time spent with university friends was asked in a battery of questions on time use. The students were asked to report, on average, how many hours per week they spend on a set of activities, including 'Spending time with friends from university'. Seven options were given, ranging from 'No time at all' to 'More than 10 h a week'. Time with university friends was asked at all four waves. In the models, we also include demographic controls (age, gender, first-generation tertiary education student, foreign-born) as well as other COVID-induced worries (worrying about getting infected with COVID-19 and worrying about personal finances due to COVID-19).

Analytical strategy

Our analyses first examine pandemic-induced worry and how it changed between autumn 2020 and spring 2022. We compare the experiences of students in the COVID cohort to more senior students, grouped by time in higher education. We also compare the COVID cohort to students who matriculated one year later in autumn 2021. Although we only have two measure points for this latter cohort (i.e. autumn 2021 and spring 2022), mapping their development is necessary to make certain that any observed difference is neither a reflection of a general pandemic effect where all student groups are affected equally nor a 'normal' student trajectory where new students generally grow more worried/dissatisfied/pessimistic between the first and second semester. We acknowledge that students who began their studies in autumn 2021 still represent a COVID cohort, in the sense that the pandemic was still ongoing at the time of their matriculation. Nevertheless, we argue that their first-year experience differs from that of the cohort that matriculated in autumn 2020 in important ways. First, when they applied to university (mid-April 2021), courses and programmes had already been online for a year, suggesting that they were more aware that online education might characterize their first year. Relatedly, by the time of their matriculation, universities had more experience with online education, suggesting that both instructors and students were better at navigating the challenges associated with online education. Also, compared to the COVID cohort, the first-year experience of new students in 2021 was arguably characterized by greater optimism, especially considering that the Swedish authorities lifted national COVID-19 restrictions only a few weeks into their second semester. Taken together, we argue that the conditions under which new students in 2021 began their university studies implied greater chances to avoid the most detrimental study-related outcomes of online education due to the pandemic.

After mapping pandemic-induced stress over time, we use multilevel repeated measurement models to examine pandemic-induced stress in the COVID cohort compared to more senior students while controlling for compositional effects and other COVID-induced concerns. A repeated measurement model is a two-level mixed model where observations are nested in individuals. In other words, it is a hierarchical linear model (HLM) adapted for panel data (Allison 2009). Mixed models, a type of HLM, have an analytical advantage over a fixed effects or random effects model in that they include both fixed and random parts.

Additionally, we use a procedure called mean-centering to decompose key independent variables into a within and a between variable, thereby allowing for the simultaneous analysis of longitudinal and cross-sectional relationships (Allison 2009). For each key time-varying independent variable, we calculate each individual's average score across W1–W4, which we then subtract from the raw scores in each wave. This process generates two variables that, when included in the same model, allows us to capture both between-student and within-student effects in relation to the dependent variable.

All models are specified using a first order autoregressive covariance structure for the within-individual residual errors. This error structure produces the best model fit and implies that we expect higher correlations between measurements closer in time (e.g. W1 and W2) than between measurements further apart (e.g. W1 and W4).[2] In this first part, we also condition the effect of being in the COVID cohort on student experiences such as perceptions of teacher support and social integration, measured as time spent with friends and sense of community, as well as examine how such experiences relate to the development of academic stress over time.

In a second set of analyses, we look closer at consequences of the pandemic in general and pandemic-induced academic stress in particular, by looking at the development in students' life satisfaction and expectations for the future. We show how student experiences develop over the course of the pandemic within the COVID cohort compared to the different reference groups. We also investigate how between-student levels and within-student changes in academic stress is associated with life satisfaction and long-term optimism over time. Our results should provide an indication of possible scarring effects of pandemic-induced academic stress for different student groups.

Results

Figure 1 illustrates the development in students' academic stress due to the COVID-19 pandemic by student group. Focusing on students who matriculated in autumn 2020,

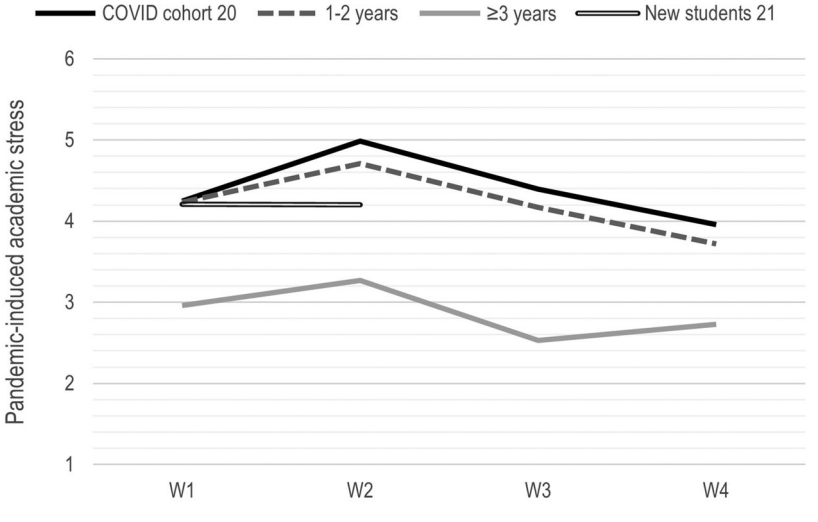

Figure 1. Pandemic-induced academic stress wave 1–4 by student group.

there is a clear increase in pandemic-induced academic stress between autumn 2020 and spring 2021. This level gradually decreases in the following academic year. While trends in experiences are similar across student groups, in line with theoretical expectations, the level of pandemic-induced academic stress is consistently higher in the COVID cohort compared to students with three or more years of university experience. Meanwhile, students with some university experience (1–2 years) are largely similar to the COVID cohort, both in terms of level and development in pandemic-induced academic stress. Figure 1 also maps pandemic-induced academic stress among students who matriculated in autumn 2021, one year after the COVID cohort entered the university. As previously discussed, we include this group to make certain that the experiences of the COVID cohort do not reflect a general development, where new students typically grow more worried about their studies between their first and second semester. Figure 1 shows that while new students 2021 initially display stress levels comparable to that of the COVID cohort, there is no increase in pandemic-induced stress between their first and second semester.

Table 1 displays findings from multilevel repeated measurement models examining pandemic-induced stress in the three student groups surveyed between autumn 2020 and spring 2022.[3] Results from the first two models are consistent with the findings presented in Figure 1. Pandemic-induced academic stress increased in all groups between autumn 2020 and spring 2021; however, the level of stress significantly diverges between the COVID cohort and the most experienced students but not between the COVID cohort and students with 1–2 years of university experience. These differences remain when controlling for demographic variables, other student experiences, and other pandemic-induced worries (i.e. getting infected and personal finances) in model 3.[4] Interestingly, teacher support has no general mitigating effect on pandemic-induced academic stress and neither does sense of community in class. However, as evident in model 4 and 5, both types of experiences moderate the effect of student group by reducing the difference in academic stress between the COVID cohort and the most senior students ($\geq$ 3 years). These relationships are illustrated in Figure 2(a, b), demonstrating that COVID cohort students who strongly agree with having teacher support or sense of community in class report similar levels of pandemic-induced academic stress compared to more experienced students. Contrary to expectations, time spent with university friends is associated with more pandemic-induced academic stress, although slightly less so for the COVID cohort compared to the most senior students (model 6).[5]

Figure 3 maps the development in life satisfaction between autumn 2020 and spring 2022 across student groups. The COVID cohort reports a lower level of life satisfaction compared to the most senior students ($\geq$3 years), but similar levels to students with 1–2 years of university experience. There seems to be a pandemic effect in all groups, in the sense that life satisfaction generally drops between autumn 2020 and spring 2021. However, the decrease is most substantial for the COVID cohort. Turning to new students 2021, their life satisfaction also drops somewhat between their first and second academic semester. However, this change occurs at a different time point (autumn 2021 to spring 2022), when also the COVID cohort and students with 1–2 years university experience report, on average, a decrease in life satisfaction.

Table 1. Multilevel repeated measurement models of pandemic-induced academic stress, waves 1–4.

	(1)	(2)	(3)	(4)	(5)	(6)
Fixed						
Intercept	2.93(1.00)***	2.99(0.11)***	1.15(0.34)**	0.05(0.50)	0.65(0.43)	0.98(0.35)**
Wave (ref = W1)						
W2	0.49(0.08)***	0.32(0.15)*	0.42(0.08)***	0.42(0.08)***	0.42(0.09)***	0.42(0.08)***
W3	−0.13(0.11)	−0.49(0.20)*	−0.07(0.12)	−0.07(0.12)	−0.08(0.12)	−0.07(0.12)
W4	−0.40(0.12)**	−0.31(0.24)	−0.26(0.13)*	−0.27(0.13)*	−0.26(0.13)*	−0.26(0.13)
Student cohort (ref=≥3 years)						
1–2 years	1.32(0.13)***	1.26(0.14)***	0.82(0.16)***	1.83(0.62)**	1.04(0.48)*	1.09 (0.22)***
COVID cohort	1.36(0.13)***	1.24(0.15)***	0.91(0.18)***	3.70(0.71)***	2.36(0.48)***	1.26(0.25)***
Wave # Student cohort (ref=#≥3 years)						
W2# 1–2 years		0.16(0.19)				
W2# COVID cohort		0.36(0.20)				
W3# 1–2 years		0.38(0.26)				
W3# COVID cohort		0.63(0.28)*				
W4# 1–2 years		−0.11(0.30)				
W4# COVID cohort		−0.13(0.33)				
Gender (ref = Man)						
Woman			−0.19(0.13)	−0.18(0.13)	−0.18(0.13)	−0.19(0.13)
Other			−0.15(0.48)	−0.15(0.48)	−0.08(0.48)	−0.10(0.48)
Age W1			−0.05(0.01)***	−0.05(0.01)***	−0.05(0.01)***	−0.05(0.01)***
Foreign born			0.50(0.17)**	0.47(0.17)**	0.51(0.17)**	0.49(0.17)**
First-generation student			0.12(0.13)	0.12(0.13)	0.11(0.13)	0.11(0.13)
Worry infection (b)			0.18(0.03)***	0.18(0.03)***	0.18(0.03)***	0.18(0.03)***
Worry infection (w)			0.12(0.03)***	0.12(0.03)***	0.12(0.03)***	0.12(0.03)***
Worry finances (b)			0.38(0.02)***	0.38(0.02)***	0.38(0.02)***	0.38(0.02)***
Worry finances (w)			0.32(0.02)***	0.32(0.02)***	0.32(0.02)***	0.32(0.02)***
Teacher support (W2)			−0.02(0.07)	0.27(0.12)*	−0.04(0.07)	−0.02(0.07)
Sense of community (W2)			−0.10(0.06)	−0.10(0.06)	0.08(0.11)	−0.10(0.06)
Time with university friends (b)			0.27(0.04)***	0.27(0.04)***	0.27(0.04)***	0.40(0.07)***
Time with university friends (w)			−0.02(0.04)	−0.02(0.04)	−0.02(0.04)	−0.02(0.04)
Moderations						
Teacher support# student cohort (ref = # ≥ 3 years)						
# 1–2 years				−0.26(0.16)		
# COVID cohort				−0.73(0.18)***		
Sense of community# Student cohort (ref = # ≥ 3 years)						
# 1–2 years					−0.07 (0.14)-	
# COVID cohort					0.44(0.14)**	
Time with university friends # student cohort (ref = #≥3 years)						

# 1–2 years						−0.16(0.08)
# COVID cohort						−0.18(0.09)*
Random						
Intercept	3.82(0.30)	3.82(0.30)	2.33(0.27)	2.29(0.27)	2.29(0.27)	2.32(0.27)
Residuals Rho	0.19 (0.04)	0.19 (0.04)	0.17(0.04)	0.17(0.04)	0.17(0.04)	0.17(0.04)
Var (e)	5.44(.27)	5.44(.27)	4.83(0.25)	4.82(0.25)	4.83(0.25)	4.82(0.25)
n	2722	2722	1372	1372	1372	1372
Obs	5126	5126	3523	3523	3523	3523
Bic	25236.81	25279.76	16622.50	16622.30	16627.67	16633.77

Notes: Standard errors in parentheses. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. (w), within-person effects; (b), between-person effects.

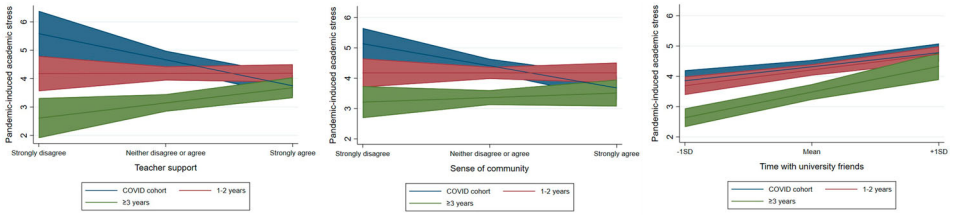

Figure 2. Pandemic-induced academic stress by student group: moderation by student experiences. Predictive margins with 95% confidence intervals.

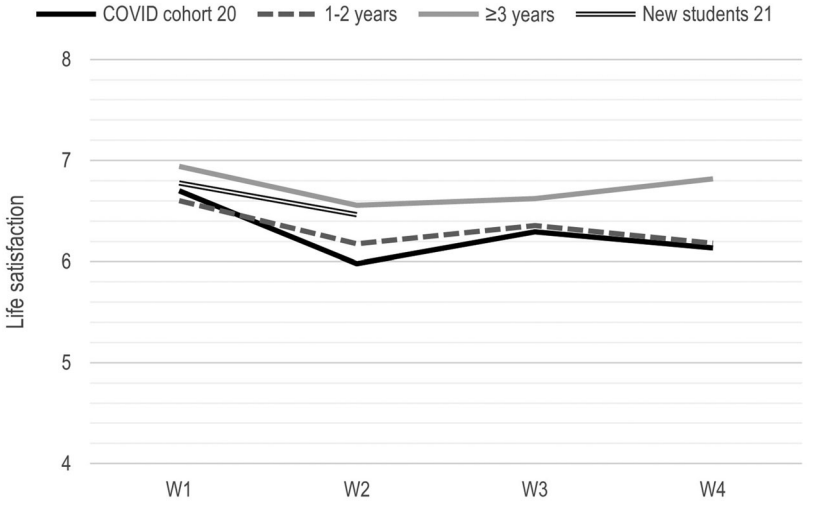

Figure 3. Life satisfaction wave 1–4 by student group.

Table 2 (model 1 and 2) confirms the group differences in level and development in life satisfaction for the COVID cohort compared to more senior students. As in the case of pandemic-induced academic stress, the COVID cohort largely overlaps with students with 1–2 years of university experience in terms of the degree of life satisfaction. However, the decrease in life satisfaction W1 to W2 is greater in the COVID cohort compared to the other two student groups (model 2). Adding pandemic-induced academic stress to model 3 shows that students who experience more academic stress generally are less satisfied with life, but also that fluctuations in pandemic-induced academic stress explain changes in life satisfaction over time. The same applies to pandemic-induced financial worry, while worrying over getting infected by the virus and the different indicators of social and academic integration are positively related to life satisfaction.

In a final set of analyses, we look at the development in students' expectations for the future over the course of the pandemic and in relation to pandemic-induced academic stress. Figure 4 illustrates the development W1-4 in the different student groups. The graph reveals little differences in students' long-term optimism, both over time and between groups. Thus, there is limited support for a pandemic effect, or for a cohort effect, in predicting where the students see themselves in ten years' time. Students

Table 2. Multilevel repeated measurement models of life satisfaction, waves 1–4.

	(1)	(2)	(3)
Fixed			
Intercept	7.00(0.06)***	6.95(0.07)***	5.99(0.23)***
Wave (ref = W1)			
W2	−0.50(0.05)***	−0.35(0.09)***	−0.39(0.05)***
W3	−0.29(0.06)***	−0.25(0.12)*	−0.30(0.07)***
W4	−0.37(0.07)***	−0.06(0.14)	−0.35(0.08)***
Student cohort (ref=≥3 years)			
1–2 years	−0.38(0.08)***	−0.35(0.09)***	−0.28(0.11)**
COVID cohort	−0.38(0.08)***	−0.24(0.09)*	−0.16(0.12)
Wave# Student cohort (ref=# ≥ 3 years)		.	.
W2# 1–2 years		−0.07(0.11)	
W2# COVID cohort		−0.41(0.12)**	
W3# 1–2 years		0.06(0.16)	
W3# COVID cohort		−0.23(0.17)	
W4# 1–2 years		−0.37(0.18)*	
W4# COVID cohort		−0.50(0.20)*	
Gender (ref = Man)			
Woman			0.20(0.08)*
Other			−0.79(0.32)*
Age W1			0.02(0.01)***
Foreign born			0.29(0.11)*
First-generation student			0.02(0.08)
Worry studies (b)			−0.14(0.02)***
Worry studies (w)			−0.03(0.01)*
Worry infected (b)			0.07(0.02)***
Worry infected (w)			−0.02(0.02)
Worry finances (b)			−0.14(0.02)***
Worry finances (w)			−0.05(0.02)**
Teacher support (W2)			0.18(0.05)***
Sense of community (W2)			0.12(0.04)**
Time with university friends (b)			0.15(0.02)***
Time with university friends (w)			0.13(0.02)***
Random			
Intercept	1.73(0.11)	1.73(0.11)	1.15(0.11)
Residuals (AR1) Rho	0.16(0.04)	0.16(0.04)	0.18(0.04)
Var (e)	1.91(0.09)	1.90(0.09)	1.90(0.10)
n	2696	2696	1370
obs	5077	5077	3501
Bic	20094.33	20125.43	13410.18

Notes: Standard errors in parentheses. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. (w), within-person effects; (b), between-person effects.

matriculating in autumn 2021 become slightly more pessimistic between autumn 2021 and spring 2022, as do the COVID cohort and students with 1–2 years of university experience. The absence of pandemic and cohort effects is confirmed in the first two models in Table 3. As the third model shows, worrying over studies due to COVID-19 is associated with less between-student differences in long-term optimism, but once controls are added, an increase in worry predicts slightly more optimism over time. Taken together, these results suggest that the pandemic in general and pandemic-induced academic stress in particular have no clear detrimental effects on students' optimism about the future.

Conclusion

Our study shows that there was a general increase in pandemic-induced academic stress during the first year of online education due to the COVID-19 pandemic. This increase

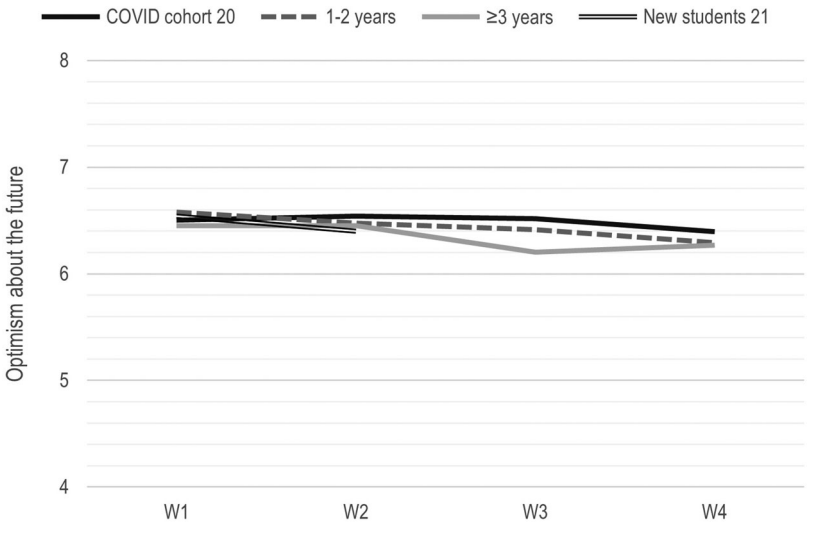

Figure 4. Optimism about the future wave 1–4 by student group.

occurred between autumn 2020 and spring 2021, whereafter the degree of stress gradually decreased. These results are concerning given the negative outcomes associated with academic-related stress highlighted by previous research. While some of these negative outcomes (e.g. not graduating from university) are outside the scope of our analysis, we do find that students' worries about their studies were negatively associated with life satisfaction, arguably putting them at risk for longer-term negative consequences like dropout.

Results also show considerable variation within our student sample. The so-called COVID cohort, who matriculated in 2020, reported more academic stress than the most senior students, but similar levels compared to students with 1–2 years of university experience. We believe these elevated levels of academic stress are due to a combination of factors that include, among other things, a lack of academic and social integration gained from university experience prior to the pandemic and the subsequent shift to online learning. The overlap with students with some pre-pandemic experience (1–2 years) underscores that the level of integration required to handle challenges posed by online learning during a global pandemic not necessary is obtained within a year. Indeed, previous research suggests that academic integration and adjusting to university-specific modes of learning is a gradual process (Kember 2001). It is also important to note that some of the students in the 1–2 years category matriculated autumn 2019, implying that they were still in their first year when universities in Sweden moved all courses online on the 18th of March 2020.

Our results also show that pandemic-induced academic stress can be mitigated by experiences that foster integration. Focusing on the COVID cohort, we find that students who reported higher levels of support from their teachers and those who felt a stronger sense of community were less likely to experience academic stress. In fact, students in the COVID cohort who scored high on these measures reported similar levels of academic stress as the more senior students. Teacher support and sense of community did not have the same effect for more senior students, suggesting a lower need, arguably due

Table 3. Multilevel repeated measurement models of optimism about the future, waves 1–4.

	(1)	(2)	(3)
Fixed			
Intercept	6.45(0.06)***	6.45(0.05)***	6.09(0.21)***
Wave (ref = W1)			
W2	0.01(0.04)	0.08(0.07)	0.00(0.04)
W3	−0.07(0.05)	−0.20(0.09)*	−0.09(0.05)
W4	−0.13(0.06)*	−0.05(0.11)	−0.11(0.06)
Student cohort (ref = ≥3 years)			
1–2 years	0.11(0.07)	0.13(0.08)	−0.11(0.10)
COVID cohort	0.06(0.07)	0.05(0.08)	−0.02(0.11)
Wave# Student cohort (ref=# ≥ 3)		.	.
W2# 1–2 years		−0.12(0.09)	
W2# COVID cohort		−0.05(0.09)	
W3# 1–2 years		0.17(0.12)	
W3# COVID cohort		0.19(0.13)	
W4# 1–2 years		−0.13(0.14)	
W4# COVID cohort		−0.06(0.15)	
Gender (ref = Man)			
Woman			−0.01(0.08)
Other			−0.89(0.30)**
Age W1			−0.00(0.00)
Foreign born			0.17(0.10)
First-generation student			−0.22(0.08)**
Worry studies (b)			−0.06(0.02)***
Worry studies (w)			0.02(0.01)*
Worry infected (b)			0.00(0.02)
Worry infected (w)			−0.01(0.01)
Worry finances (b)			−0.08(0.02)***
Worry finances (w)			−0.02(0.01)*
Teacher support (W2)			0.12(0.04)**
Sense of community (W2)			0.06(0.04)
Time with university friends (b)			0.14(0.02)***
Time with university friends (w)			0.01(0.02)
Random			
Individual	1.57(0.07)	1.56(0.07)	1.33(0.07)
Residuals (AR1) Rho	0.11(0.04)	0.12(0.04)	0.05(0.04)
Var (e)	1.05(0.05)	1.05(0.05)	0.93(0.04)
N	2803	2803	1371
obs	5242	5242	3508
Bic	18589.02	18632.73	11894.26

Notes: Standard errors in parentheses. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. (w), within-person effects; (b), between-person effects.

to higher levels of integration when courses moved online. Taken together, these findings suggest that universities and teachers should take steps to decrease academic stress by supporting and engaging students, especially those just beginning their tenure in higher education.

The findings concerning life satisfaction further support these conclusions. On average, less experienced students display lower levels of life satisfaction, and as the pandemic deepened and it became clear that courses would remain online, the COVID cohort also experienced the largest drop in life satisfaction. While we acknowledge that other factors also may have contributed to these differences, our analysis shows that both the degree of, and development in, life satisfaction was related to pandemic-induced academic stress.

Moreover, although academic stress due to COVID-19 and life satisfaction gradually improved after spring 2021, cohort differences remained. For example, when comparing average life satisfaction at wave 4 (spring 2022), the more junior students (i.e. the COVID

cohort and students with 1–2 years of experience) still reported significantly lower levels of life satisfaction compared to the most senior students in the panel. They also reported lower levels of life satisfaction compared to the most senior students at wave 1, as well as to their own reported life satisfaction at wave 1. Since the COVID cohort is, at the time of this writing, still at the midst of their university careers it is possible that longer-term effects of this academic stress and low life satisfaction are still to come. This should concern both universities, and societies more generally, since research shows a 'scarring effect' for those that attend university but are unable to finish (Hällsten 2017).

Meanwhile, we do not find any evidence that the pandemic in general and pandemic-induced academic stress in particular have led students to adopt a less optimistic view of the future. While the origins and stability of optimism are not yet fully established (Scheier and Carver 2018), at least our results show that Swedish university students' long-term optimism was not severely damaged by the COVID-19 pandemic. This is encouraging, not least given how optimism is important for coping with crises and challenges (Carbone and Echols 2017).

There are four limitations to our research worth noting. First, we cannot empirically distinguish between a general COVID-19 effect and possible negative consequences specific to online learning. On theoretical grounds, we consider online learning the main mechanism, but because its implementation at Swedish universities was close to universal, we have no way of testing that empirically. Second, we do not know the consequences of pandemic-induced academic stress on persistence, attrition, and academic performance. Previous research provides clues, but we do not yet know if patterns hold in the context of this extraordinary situation.

Third, while our main dependent variable asks specifically about worries about studies in relation to the COVID-19 pandemic, we do not know to what extent it also captures general academic-related stress. As previous research shows that stress tends to be higher for first-year students (Beiter et al. 2015), some of the observed difference between the COVID cohort and others may stem simply from being new to university life. Still, we also find differences between the COVID cohort and students who matriculated in 2021, suggesting that pandemic-specific circumstances are indeed important in this regard. Also, the COVID cohort experienced a greater drop in life satisfaction compared to all reference groups, which is both a novel finding and disconcerting trend.

A fourth limitation is attrition – an issue common to all longitudinal survey research. The main problem with attrition is that is often impossible to know if respondents stop participating for reasons associated with the phenomenon of interest. To illustrate, it is possible that some of student who opted out of our survey experienced an increase in academic stress due to the pandemic. Although analyses of key indicators from wave 1 reveal no significant differences between that those who opted out in a later wave and those who continued to participate, we cannot rule out the possibility that those who remain in and those who opt-out differ on variables that were never measured or that they were more or less prone to change between 2020 and 2022.

Limitations notwithstanding, our analysis brings a longitudinal perspective to the burgeoning literature on the impact of the COVID-19 pandemic and the subsequent shift to online learning on student experiences. We have highlighted some negative outcomes in terms of academic stress and its consequences. Our results may also inform higher

education institutions about which students are at higher risk during crises as well as about possible remedies to meet extraordinary challenges.

Notes

1. Nor do we wade into the empirical debate over its efficacy (Ortagus 2018; Bettinger et al. 2017).
2. Considering optimism about the future may be slower to change than our other two dependent variables, we also ran models with a second order autogressive structure (AR2). Model fit statistics slightly favour AR2 over AR1 (BIC: 18724.78 vs. 18725.85) for this dependent variable but not for academic stress or life satisfaction. However, the results and their interpretation remain the same. These models are available from the authors upon request.
3. All models in Tables 1–3 are random intercept models. We have run alternative models that include random slopes for wave. These models tend to be poorer fitting and produced the same findings as the random intercept models. Thus, we only report results from the random intercept models. Results from the alternative random slopes models are available from the authors upon request.
4. We have also run all models controlling for faculty (Medicine, Science and Technology, Arts and Humanities and Social Sciences). While we only have this information for a subset of the sample, these alternative models confirm the results in Tables 1–3.
5. While a closer examination of this relationship falls outside the scope of the current study, it is possible that it is worry that influences students' social activities. In other words, students who worry extensively over their studies may be more likely to seek the company of fellow students compared to students who score low on pandemic-induced academic stress.

Author contributions

Survey design: AB, ME, MH, JM; Data collection: AB, ME, MH, JM; Research question: AB; Analytical strategy: AB, ME, MH, JM; Empirical analyses: AB; Text: AB, ME, MH, JM.

Declarations

The research was reviewed and approved by the Swedish Ethical Review Agency. Approval no: 2019-02817.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

Data are from an ongoing research project. Data that support the findings of this study are available from the corresponding author, [AB], upon reasonable request. The full dataset will be made publicly available after the data collection is completed, via the creation of a repository with the Swedish National Data Service (SND).

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References

Adams, D. R., S. A. Meyers, and R. S. Beidas. 2016. "The Relationship Between Financial Strain, Perceived Stress, Psychological Symptoms, and Academic and Social Integration in Undergraduate Students." *Journal of American College Health* 64 (5): 362–370. doi:10.1080/07448481.2016.1154559.

Allen, I. E., and J. Seaman. 2013. *Changing Course: Ten Years of Tracking Online Education in the United States*. Babson Park, MA: Babson Survey Research Group. https://files.eric.ed.gov/fulltext/ED541571.pdf.

Allison, P. D. 2009. *Fixed Effects Regression Models*. Thousand Oaks, CA: SAGE.

Alpert, W. T., K. A. Couch, and O. R. Harmon. 2016. "A Randomized Assessment of Online Learning." *American Economic Review* 106 (5): 378–382. doi:10.1257/aer.p20161057.

Aucejo, E. M., J. French, M. P. Ugalde Araya, and B. Zafar. 2020. "The Impact of COVID-19 on Student Experiences and Expectations: Evidence from a Survey." *Journal of Public Economics* 191: 104271. doi:10.1016/j.jpubeco.2020.104271.

Bean, J. P., and B. S. Metzner. 1985. "A Conceptual Model of Nontraditional Undergraduate Student Attrition." *Review of Educational Research* 55 (4): 485–540. doi:10.3102/00346543055004485.

Bedewy, D., and A. Gabriel. 2015. "Examining Perceptions of Academic Stress and its Sources Among University Students: The Perception of Academic Stress Scale." *Health Psychology Open* 2 (2): 1-9. doi:10.1177/2055102915596714.

Beiter, R., R. Nash, M. McCrady, D. Rhoades, M. Linscomb, M. Clarahan, and S. Sammut. 2015. "The Prevalence and Correlates of Depression, Anxiety, and Stress in a Sample of College Students." *Journal of Affective Disorders* 173: 90–96. doi:10.1016/j.jad.2014.10.054.

Bettinger, E. P., L. Fox, S. Loeb, and E. S. Taylor. 2017. "Virtual Classrooms: How Online College Courses Affect Student Success." *American Economic Review* 107 (9): 2855–2875. doi:10.1257/aer.20151193.

Borkovec, T. 1994. "The Nature, Functions and Origins of Worry." In *In Worrying: Perspectives on Theory, Assessment and Treatment*, edited by G. Davey and F. Tallis, 5–34. Chichester, England: Wiley.

Brooman, S., and S. Darwent. 2014. "Measuring the Beginning: A Quantitative Study of the Transition to Higher Education." *Studies in Higher Education* 39 (9): 1523–1541. doi:10.1080/03075079.2013.801428.

Brosschot, J. F., W. Gerin, and J. F. Thayer. 2006. "The Perseverative Cognition Hypothesis: A Review of Worry, Prolonged Stress-Related Physiological Activation, and Health." *Journal of Psychosomatic Research* 60 (2): 113–124. doi:10.1016/j.jpsychores.2005.06.074.

Browning, M. H. E. M., L. R. Larson, I. Sharaievska, A. Rigolon, O. McAnirlin, et al. 2022. "Correction: Psychological Impacts from COVID-19 among University Students: Risk Factors Across Seven States in the United States." *PLOS ONE* 17 (8): e0273938. doi:10.1371/journal.pone.0273938.

Calandri, E., F. Graziano, T. Begotti, E. Cattelino, S. Gattino, C. Rollero, and A. Fedi. 2021. "Adjustment to COVID-19 Lockdown Among Italian University Students: The Role of Concerns, Change in Peer and Family Relationships and in Learning Skills, Emotional, and Academic Self-Efficacy on Depressive Symptoms." *Frontiers in Psychology* 12: 643088. doi:10.3389/fpsyg.2021.643088.

Camacho, A., N. Correia, S. Zaccoletti, and J. R. Daniel. 2021. "Anxiety and Social Support as Predictors of Student Academic Motivation During the COVID-19." *Frontiers in Psychology* 12: 644338. doi:10.3389/fpsyg.2021.644338.

Carbone, E. G., and E. T. Echols. 2017. "Effects of Optimism on Recovery and Mental Health After a Tornado Outbreak." *Psychology & Health* 32 (5): 530–548. doi:10.1080/08870446.2017.1283039.

Chaturvedi, K., D. K. Vishwakarma, and N. Singh. 2021. "COVID-19 and its Impact on Education, Social Life and Mental Health of Students: A Survey." *Children and Youth Services Review* 121: 105866. doi:10.1016/j.childyouth.2020.105866.

Cheung, F., and R. E. Lucas. 2014. "Assessing the Validity of Single-Item Life Satisfaction Measures: Results from Three Large Samples." *Quality of Life Research* 23: 2809–2818. doi:10.1007/s11136-014-0726-4.

Cochran, J. D., S. M. Campbell, H. M. Baker, and E. M. Leeds. 2014. "The Role of Student Characteristics in Predicting Retention in Online Courses." *Research in Higher Education* 55 (1): 27–48. doi:10.1007/s11162-013-9305-8.

Colby, D. A., and K. Shifren. 2013. "Optimism, Mental Health, and Quality of Life: A Study among Breast Cancer Patients." *Psychology, Health & Medicine* 18 (1): 10–20. doi:10.1080/13548506.2012.686619.

Deil-Amen, R. 2011. "Socio-Academic Integrative Moments: Rethinking Academic and Social Integration among Two-Year College Students in Career-Related Programs." *The Journal of Higher Education* 82 (1): 54–91. doi:10.1353/jhe.2011.0006.

Dixson, M. D. 2010. "Creating Effective Student Engagement in Online Courses: What Do Students Find Engaging?" *Journal of the Scholarship of Teaching and Learning* 10 (2): 1–13. https://files.eric.ed.gov/fulltext/EJ890707.pdf.

Flores, M. A., A. Barros, A. M. V. Simão, D. Pereira, P. Flores, E. Fernandes, and P. C. Ferreira. 2022. "Portuguese Higher Education Students' Adaptation to Online Teaching and Learning in Times of the COVID-19 Pandemic: Personal and Contextual Factors." *Higher Education*, doi:10.1007/s10734-021-00748-x.

Frydenberg, J. 2007. "Persistence in University Continuing Education Online Classes." *The International Review of Research in Open and Distributed Learning* 8 (3): 1–15. doi:10.19173/irrodl.v8i3.375.

Gaebel, M., V. Kupriyanova, R. Morais, and E. Colucci. 2014. *E-Learning in European Higher Education Institutions*. European University Association. https://eua.eu/resources/publications/368:e-learning-in-european-higher-education-institutions.html.

Gogol, K., M. Brunner, T. Goetz, R. Martin, S. Ugen, U. Keller, … F. Preckel. 2014. "'My Questionnaire is Too Long!' The Assessments of Motivational-Affective Constructs with Three-Item and Single-Item Measures." *Contemporary Educational Psychology* 39 (3): 188–205. doi:10.1016/j.cedpsych.2014.04.002.

Hadjar, A., C. Haas, and I. Gewinner. 2022. "Refining the Spady–Tinto Approach: The Roles of Individual Characteristics and Institutional Support in Students' Higher Education Dropout Intentions in Luxembourg." *European Journal of Higher Education*, doi:10.1080/21568235.2022.2056494.

Hällsten, M. 2017. "Is Education a Risky Investment? The Scarring Effect of University Dropout in Sweden." *European Sociological Review* 33 (2): jcw053–jcw181. doi:10.1093/esr/jcw053.

Hurtado, S. 2007. "The Study of College Impact." In *Sociology of Higher Education: Contributions and Their Contexts*, edited by P. J. Gumport, 94–112. Baltimore: Johns Hopkins University Press.

Kember, D. 2001. "Beliefs About Knowledge and the Process of Teaching and Learning as a Factor in Adjusting to Study in Higher Education." *Studies in Higher Education* 26 (2): 205–221. doi:10.1080/03075070120052116.

Krause, K. 2001. "The University Essay Writing Experience: A Pathway for Academic Integration During Transition." *Higher Education Research & Development* 20 (2): 147–168. doi:10.1080/07294360123586.

Lundstedt, J. 2022. "Aktiviteten på campus tillbaka till nivån före pandemin." Report No. 51-00435-20. Swedish Higher Education Authority (UKÄ). Accessed September 19, 2022. https://www.uka.se/download/18.55f1625b1817ff30a861225/1655983559975/rapport-2022-06-23-aktiviteten-pa-campus-tillbaka-till-nivan-fore-pandemin.pdf.

Matos Fialho, P. M., F. Spatafora, L. Kühne, H. Busse, S. M. Helmer, H. Zeeb, and C. R. Pischke. 2021. "Perceptions of Study Conditions and Depressive Symptoms During the COVID-19 Pandemic Among University Students in Germany: Results of the International COVID-19 Student Well-Being Study." *Frontiers in Public Health* 9, doi:10.3389/fpubh.2021.674665.

Naylor, R., C. Baik, and S. Arkoudis. 2018. "Identifying Attrition Risk Based on the First Year Experience." *Higher Education Research & Development* 37 (2): 328–342. doi:10.1080/07294360.2017.1370438.

OECD. 2021. *The State of Higher Education: One Year into the COVID-19 Pandemic*. Paris: OECD Publishing. doi:10.1787/83c41957-en.

Ortagus, J. 2017. "From the Periphery to Prominence: An Examination of the Changing Profile of Online Students in American Higher Education." *The Internet and Higher Education* 32: 47–57. doi:10.1016/j.iheduc.2016.09.002.

Ortagus, J. 2018. "National Evidence of the Impact of First-Year Online Enrollment on Postsecondary Students' Long-Term Academic Outcomes." *Research in Higher Education* 59 (8): 1035–1058. doi:10.1007/s11162-018-9495-1.

Pascoe, M. C., S. E. Hetrick, and A. G. Parker. 2020. "The Impact of Stress on Students in Secondary School and Higher Education." *International Journal of Adolescence and Youth* 25 (1): 104–112. doi:10.1080/02673843.2019.1596823.

Piepenburg, J. G., and J. Beckmann. 2022. "The Relevance of Social and Academic Integration for Students' Dropout Decisions. Evidence from a Factorial Survey in Germany." *European Journal of Higher Education* 12 (3): 255–276. doi:10.1080/21568235.2021.1930089.

Plakhotnik, M. S., N. V. Volkova, C. Jiang, D. Yahiaoui, G. Pheiffer, K. McKay, S. Newman, and S. Reißig-Thust. 2021. "The Perceived Impact of COVID-19 on Student Well-Being and the Mediating Role of the University Support: Evidence from France, Germany, Russia, and the UK." *Frontiers in Psychology* 12: 642689. doi:10.3389/fpsyg.2021.642689.

Putwain, D. 2007. "Researching Academic Stress and Anxiety in Students: Some Methodological Considerations." *British Educational Research Journal* 33 (2): 207–219. doi:10.1080/01411920701208258.

Resch, K., G. Alnahdi, and S. Schwab. 2022. "Exploring the Effects of the COVID-19 Emergency Remote Education on Students' Social and Academic Integration in Higher Education in Austria." *Higher Education Research & Development*, doi:10.1080/07294360.2022.2040446.

Rovai, A. P. 2003. "In Search of Higher Persistence Rates in Distance Education Online Programs." *The Internet and Higher Education* 6 (1): 1–16. doi:10.1016/S1096-7516(02)00158-6.

Scheier, M. F., and C. S. Carver. 2018. "Dispositional Optimism and Physical Health: A Long Look Back, a Quick Look Forward." *American Psychologist* 73 (9): 1082–1094. doi:10.1037/amp0000384.

Sweeny, K., and M. D. Dooley. 2017. "The Surprising Upsides of Worry." *Social and Personality Psychology Compass* 11 (4): e12311. doi:10.1111/spc3.12311.

Syropoulos, S., D. J. Wu, B. Burrows, and E. Mercado. 2021. "Psychology Doctoral Program Experiences and Student Well-Being, Mental Health, and Optimism During the COVID-19 Pandemic." *Frontiers in Psychology* 12: 629205. doi:10.3389/fpsyg.2021.629205.

Tinto, V. 1975. "Dropout from Higher Education: A Theoretical Synthesis of Recent Research." *Review of Educational Research* 45 (1): 89–125. doi:10.3102/00346543045001089.

Tinto, V. (1987) 1993. *Leaving College: Rethinking the Causes and Cures of Student Attrition*. Chicago: University of Chicago Press.

Vizoso, C., O. Arias-Gundín, and C. Rodríguez. 2019. "Exploring Coping and Optimism as Predictors of Academic Burnout and Performance among University Students." *Educational Psychology* 39 (6): 768–783. doi:10.1080/01443410.2018.1545996.

Wilcox, P., S. Winn, and M. Fyvie-Gauld. 2005. "'It was Nothing to Do with the University, It was Just the People': The Role of Social Support in the First-Year Experience of Higher Education." *Studies in Higher Education* 30 (6): 707–722. doi:10.1080/03075070500340036

Wolf-Wendel, L., K. Ward, and J. Kinzie. 2009. "A Tangled web of Terms: The Overlap and Unique Contribution of Involvement, Engagement, and Integration to Understanding College Student Success." *Journal of College Student Development* 50 (4): 407–428. doi:10.1353/csd.0.0077.

Yang, D., C.C. Tu, and X. Dai. 2020. "The Effect of the 2019 Novel Coronavirus Pandemic on College Students in Wuhan." *Psychological Trauma: Theory, Research, Practice, and Policy* 12: S6–S14. doi:10.1037/tra0000930

Table A1. Descriptive statistics by wave and student cohort.

	Wave 1				Wave 2				Wave 3			Wave 4		
Student cohort	A	B	C	D	A	B	C	D	A	B	C	A	B	C
Academic semester	Autumn 2020	Autumn 2020	Autumn 2020	Autumn 2021	Spring 2021	Spring 2021	Spring 2021	Spring 2022	Autumn 2021	Autumn 2021	Autumn 2021	Spring 2022	Spring 2022	Spring 2022
N	1014	1142	982	917	462	600	455	183	238	305	188	177	257	154
Gender *M* (SD)	0.7(0.5)	0.7(0.5)	0.7(0.5)	0.7(0.5)	0.7(0.5)	0.7 (0.5)	0.7(0.5)	0.7(0.5)	0.7(0.5)	0.7(0.5)	0.7(0.5)	0.7 (0.5)	0.7(0.5)	0.5(0.5)
Age *M* (SD)	23.5(7.2)	25.9(7.6)	35.1(11.6)	22.6(6.2)	23.9(6.3)	26.9(7.5)	36.5 (11.8)	23.1(6.0)	24.2(7.4)	26.5(6.7)	36.8(12.7)	25.3(7.0)	27.8(7.5)	38.6 (12.3)
Age median	21	23	31	20	22	24	33	21	22	24	32	23	25	35
Foreign-born *M* (SD)	0.1(0.3)	0.2(0.4)	0.3(0.4)	0.2(0.4)	0.1(0.3)	0.1(0.3)	0.2(0.4)	0.2(0.4)	0.1(0.3)	0.1(0.3)	0.2(0.4)	0.1(0.3)	0.1(0.3)	0.2(0.4)
First-generation student *M* (SD)	0.4(0.5)	0.3(0.5)	0.4(0.5)	0.3(0.5)	0.3(0.5)	0.3(0.5)	0.4(0.5)	0.2(0.4)	0.3(0.5)	0.3(0.5)	0.4(0.5)	0.4(0.5)	0.4(0.5)	0.4(0.5)
Study worry *M* (SD)	4.2(3.0)	4.2(3.0)	3.0(3.0)	4.2(3.0)	5.0(3.1)	4.7(3.1)	3.3(3.2)	4.2(2.8)	4.4(3.1)	4.2(3.1)	2.5(3.0)	4.0(3.1)	3.7(3.1)	2.7(3.0)
Life satisfaction *M* (SD)	6.7(1.9)	6.6(1.9)	6.9(1.9)	6.8(1.9)	6.0(1.9)	6.2(1.9)	6.6(1.9)	6.5(2.1)	6.3(2.0)	6.4(2.0)	6.6(2.2)	6.1(1.8)	6.2(2.0)	6.8(2.0)
Optimism *M* (SD)	6.5(1.5)	6.6(1.6)	6.5(1.8)	6.5(1.4)	6.5(1.5)	6.5(1.5)	6.5(1.6)	6.4(1.5)	6.5(1.6)	6.4(1.6)	6.2(2.0)	6.4(1.7)	6.3(1.7)	6.3(1.8)
Worry infection *M* (SD)	3.9(2.6)	3.9(2.6)	4.4(2.7)	4.1(2.8)	4.0(2.7)	4.4(2.8)	4.5(2.9)	3.1(2.7)	3.9(2.8)	3.9(2.7)	3.9(2.9)	2.9(2.7)	2.8(2.4)	2.9(2.7)
Worry finances *M* (SD)	3.3(2.8)	3.1(2.9)	3.8(3.1)	3.2(2.9)	3.2(2.9)	3.0(3.0)	3.4(3.1)	2.9(2.8)	3.0(2.6)	3.1(2.8)	3.3(2.9)	3.2(2.8)	3.0(2.9)	3.0(2.8)
Teacher support W2 *M* (SD)	3.9(0.8)	3.8(0.9)	3.8(0.9)	4.0(0.8)	3.9(0.8)	3.8(0.9)	3.8(0.9)	4.0(0.8)	3.8(0.8)	3.9(0.8)	3.8(1.0)	3.8(0.8)	3.8(0.9)	3.9(0.9)
Sense of community W2 *M* (SD)	3.4(1.1)	3.4(1.0)	3.2(1.0)	3.7(1.0)	3.4(1.1)	3.4(1.0)	3.2(1.0)	3.7(1.0)	3.2(1.1)	3.6(1.0)	3.2(1.0)	3.3(1.1)	3.6(1.0)	3.2(1.1)
Time with university friends *M* (SD)	2.8(2.1)	3.1(2.2)	1.4(1.9)	3.0(2.1)	2.3(2.2)	2.3(2.1)	1.2(1.8)	3.1(2.1)	2.6(2.2)	2.7(2.1)	1.1(1.6)	2.9(2.2)	2.6(2.1)	1.1(1.7)

*Student cohort: A = Covid cohort matriculating autumn 2020, B = 1-2 years of university experience autumn 2020, C = 3 + years of university experience autumn 2020, D = New students matriculating autumn 2021.