TRAJECTORIES OF AND RISK FACTORS FOR UNIVERSITY STUDENTS' EMOTIONAL WELL-BEING AND DISTRESS ACROSS THE ACADEMIC YEAR

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Abstract

In recent years, post-secondary students' mental health has become an important public health concern. Guided by the dual-factor model of mental health, this study examined average mental health fluctuations and associations with a comprehensive list of pre-existing risk factors in Canadian undergraduates (*N* = 1,004, 61% women, 36% visible minority) followed 16 times throughout the 2020/2021 academic year during the COVID-19 pandemic. We used piecewise latent growth curve modelling to specify patterns of emotional well-being (positive affect) and distress (depressive and anxiety symptoms) across the year. We also examined stressful life experience and sociodemographic risk factors as predictors of baseline levels of emotional well-being and distress in September. Mental health declined in the first half of each semester, remained stable until the end of each semester, and improved over the winter break. Mental health history, past and recent stressful life experiences, age, gender, sexual orientation, visible minority status, subjective social status, and current financial strain predicted baseline mental health at the start of the academic year. This study offers novel insights into patterns of change in students' mental health and associated risks important for campus programming and intervention efforts.
***Keywords**:* university students, mental health, emotional well-being, distress, risk factors

Résumé

Au cours des dernières années, la santé mentale des personnes étudiantes aux études supérieures s'est avérée être un enjeu de santé publique d'importance. Ancrée dans le modèle à deux facteurs de la santé mentale, cette étude a examiné les fluctuations de la santé mentale moyenne ainsi que ses liens avec une liste exhaustive de facteurs de risque préexistants parmi des personnes étudiantes au premier cycle au Canada (*N* = 1,004, 61 % de femmes, 36 % de personnes racisées). Les personnes participantes ont été interrogées 16 fois au cours de l'année universitaire 2020-2021, pendant la pandémie de COVID-19. Nous avons utilisé des modèles de croissance latente par morceaux pour caractériser les patrons de changement dans le bien-être émotionnel (affect positif) et la détresse psychologique (symptômes dépressifs et anxieux) tout au long de l'année. Nous avons aussi examiné les expériences de vie stressantes et les facteurs de risque sociodémographiques en tant que prédicteurs des niveaux de base du bien-être émotionnel et de la détresse en septembre. La santé mentale s'est dégradée lors de la première moitié de chaque semestre, est restée stable jusqu'à la fin de chaque semestre, et s'est améliorée pendant le congé des fêtes de fin d'année. Les antécédents de santé mentale, les évènements de vie stressants récents et passés, le statut de « minorité visible », le statut social subjectif et les difficultés financières actuelles ont permis de prédire le niveau de base de santé mentale au début de l'année universitaire. Cette étude offre de nouvelles pistes de réflexion sur les patrons de changement de la santé mentale étudiante et les risques associés, ainsi que sur leur importance pour les programmes et les interventions sur les campus universitaires.
Mots-clés : personnes étudiantes universitaires, santé mentale, bien-être émotionnel, détresse psychologique, facteurs de risque

INTRODUCTION

The pursuit of post-secondary education has become a common experience for large proportions of Canadian youth. In 2019, almost half of young Canadians aged 18 to 24 were enrolled in universities and colleges (Chénier & Lendi, 2020). In recent years, students' mental health has been identified as an important public health problem. Results of large cross-sectional studies show concerning prevalence rates in mental health symptoms and diagnoses among university students (Linden et al., 2021; Oswalt et al., 2020) and suggest that the prevalence of certain mental health problems, such as depression, might be higher in student populations than in the general population (Ibrahim et al., 2013; Sheldon et al., 2021). Although student mental health has been the subject of considerable cross-sectional research (Linden & Stuart, 2020), knowledge is limited with respect to how student mental health fluctuates across the academic year and how risk factors intersect with mental health fluctuations. To provide adequate institutional support and services for mental health care to post-secondary students, we need to understand *when* and for *whom* help is most needed. The current study addresses key gaps in this literature by examining changes in university students' mental health over time and how risk factors are associated with students' mental health trajectories.

University Students' Emotional Well-Being and Distress Over Time

Findings from several longitudinal studies suggest that students' emotional well-being and distress fluctuate across the academic year. For example, in a general undergraduate population

from Canada, students' depressive symptoms increased in the first semester, peaked at the end of that semester, and decreased in the second semester (Barker et al., 2018). Most studies surveyed students at the starts and ends of semesters, but two studies with more time points provide a more nuanced picture of changes in students' mental health. Wang et al. (2017) measured the mental health of students in a single class in a U.S. university using a smartphone app across a semester and found that positive affect decreased and stress increased from the semester start to the midterm period. Positive affect remained at low levels after the midterm and further declined during the final period, while stress remained high between the midterm and final periods. Following Canadian university students, Milyavskaya et al. (2014) assessed positive and negative affect seven times between early September and the following August and found that (1) positive affect decreased and negative affect increased across semesters, and (2) positive affect rebounded and negative affect declined during the winter and summer breaks. Results from these studies suggest that changes in emotional well-being and distress may be more pronounced in the first half of a semester rather than in the second half. However, it is unclear from these studies who may be at higher risk for mental health deterioration during a period of risk.

Risk Factors for University Students' Emotional Well-Being and Distress

Past research with students around the globe has identified a number of mental health risk factors. One type of risk factor concerns life experiences. Past or current mental health problems (Sheldon et al., 2021) and early-life adverse experiences (e.g., abuse, negative life events, victimization) are associated with higher levels of mental health problems (Espelage et al., 2016; Karatekin, 2018; McIntyre et al., 2018; Wright et al., 2009); proximal experiences of stressful negative life events and victimization are associated with higher levels of depression and anxiety (Ebert et al., 2018; Holt et al., 2017; Newcomb-Anjo et al., 2017). Another type of risk factor concerns sociodemographic characteristics. Younger students or female students experience mental health problems at higher rates than older or male students (Velten et al., 2018). As suggested by the minority stress model (Meyer & Frost, 2013), gender and sexual minority students are found to be at higher risk for mental health problems than their cisgender, heterosexual peers (Auerbach et al., 2018; Lipson et al., 2019). Some studies also show that racial and ethnic minority students report greater psychological distress than White students (Smith et al., 2014). Students who self-rated as low in subjective social status report less positive affect and more depressive symptoms than peers with moderate-to-high subjective social status (Niu et al., 2021). Students with greater financial stress and difficulties are at increased risk of mental health problems (Farrer et al., 2016; Newcomb-Anjo et al., 2017). University-specific factors are also linked with student mental health. Compared with students early in their programs, upper-year students are at higher risk for depression, anxiety, and stress (Ma et al., 2020). Students in the humanities and those in art and design are more likely to report mental health problems than students in business, public health, and nursing (Lipson et al., 2016). International students are less likely than domestic students to report mental health problem diagnoses, despite elevated likelihood of experiencing depressive symptoms (Yeung et al., 2022).

To date, only a handful of studies have included comprehensive lists of risk factors (e.g., Eisenberg et al., 2007; Farrer et al., 2016; Ma et al., 2020; McIntyre et al., 2018; Newcomb-Anjo et al., 2017), and none assessed their relative predictive power simultaneously for both emotional well-being and distress. The dual-factor model of mental health suggests that mental wellness (e.g., emotional well-being) and illness (e.g., distress) are interrelated yet separate constructs that uniquely contribute to individual functioning and should be considered in tandem (Suldo & Shaffer, 2008).

The Current Study

Benefiting from a large representative sample of 1,004 undergraduate students and 16-wave repeated measures of mental health indicators over the course of an academic year, our first aim was to identify trajectories of emotional well-being and distress among university students. We expected that students' positive affect, depressive symptoms, and anxiety symptoms would change in a cyclical pattern: mental health would deteriorate across each semester, particularly during the first half of the semester, and improve over the winter break; the cycle would start again once the next semester begins. Our second aim was to examine the effects of a comprehensive list of risk factors on students' emotional well-being and distress trajectories. We hypothesized that the presence or higher levels of each risk factor would be positively associated with distress and negatively associated with emotional well-being among students.

METHOD

Procedure and Participants

In September of 2020, 7,000 recruitment emails were sent by the university's planning and analysis office on the first day of class to a random sample of undergraduate students enrolled at a large urban university in Canada. Across the first two weeks of classes, we reached our target sample size of 1,000. Participants completed a baseline survey in September (T1), six fall semester biweekly surveys from September to December (W1–6), an end-of-semester survey in December (T2), a start-of-semester survey in January (T3), six winter semester biweekly surveys from January to April (W7–12), and an end-of-year survey in late April (T4). Similar to previous research, we chose the semester starts and ends to survey students. Improving upon previous designs only anchored to these timepoints, we chose to also survey students every two weeks to obtain a more detailed picture of student experience across the entire academic year. For each survey, participants were asked for their consent. All participants who completed the baseline and consented were invited again for subsequent data collections unless they indicated not to be contacted again. Participants received a maximum of $90 in three installments of electronic gift cards if they completed all 16 surveys. The study was approved by the University Human Research Ethics Committee (UHREC) in accordance with the Government of Canada's *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*.

At baseline, participants (N = 1,004) represented diverse sociodemographic and identity groups that reflect the student body from which they were sampled. They were between the ages of 18 and 67 (M = 23.16, SD = 5.61). More than half were women (61%), 36% were men, and 3% self-identified as gender minority. Over two-thirds (67%) self-identified as heterosexual, 32% self-identified as sexual minority, and 16 participants did not answer the sexual orientation question. Participants identified with diverse geographic population group origins, including other (i.e., non-Indigenous) North American or European (37%), more than one group (35%), East and Southeast Asian (9%), North African or West Asian and Middle Eastern (7%), South Asian (5%), Latin, Central, and South American (3%), North American Indigenous (1%), Caribbean (1%), and Central and West African or South and East African (1%); an additional 1% identified with other geographic population groups or chose not to report. Over one-third (36%) self-identified as belonging to one or more visible minority groups, and 16% self-identified as international students. Participants were in their first (27%), second (20%), third (29%), fourth (17%), or fifth year or beyond of undergraduate study (7%). They were relatively evenly spread over four faculties: Arts and Science (26%), Engineering and Computer Science (26%), Fine Arts (24%), and Business (24%).

On average participants responded to 12 to 13 surveys (M = 12.75, SD = 4.68); 54% participated at all 16 waves. We compared attritors and non-attritors at each wave between W1 (first biweekly in fall of 2020) and T4 (end-of-year in winter of 2021). Results indicated that participation status at subsequent waves was not related to baseline scores of mental health or risk factors ($p < .0002$, Bonferroni corrected).

Measures

Emotional Well-Being and Distress

Mental health was measured at all 16 waves. *Positive affect* was measured with the 10-item positive affect subscale from the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). Participants were asked how often they felt each of 10 feelings or emotions (e.g., excited; 1 = *very slightly or not at all*, 5 = *extremely*; α's = .89–.92 in the current sample). *Depressive symptoms* were measured with the 20-item Center for Epidemiologic Studies-Depression scale (CES-D; Radloff, 1977). Participants were asked how often they experienced certain depressive symptoms (e.g., depressed; 0 = *rarely or none of the time*, 3 = *most or all of the time*; α's = .91–.93). *Anxiety symptoms* were measured with the seven-item Generalized Anxiety Disorder scale (GAD-7; Spitzer et al., 2006). Participants were asked how often they experienced certain anxiety symptoms (e.g., anxious; 0 = *not at all*, 3 = *nearly every day*; α's = .90–.94). Higher average scores indicate more positive affect, depressive symptoms, or anxiety symptoms.

Risk Factors

Stressful life experiences and sociodemographic/university characteristics were measured at baseline. To assess *COVID-19 pandemic stress*, an eight-item COVID-19 Pandemic Stress Index was developed for our study (a formal validation study on the measure has not been conducted). Participants reported whether they experienced pandemic-related changes in life circumstances (e.g., living arrangement, employment), and whether there were COVID-19 diagnoses and related hospitalizations or deaths among people they knew (self included). Responses were dichotomized (0 = *no such experience*, 1 = *had such experience*) and summed, with higher scores indicating greater pandemic stress (*M* = 2.76, *SD* = 1.38). *Mental health history* was assessed with one item asking whether they have ever been diagnosed with, treated for, or sought help for a mental health problem, with responses coded as 0 = *no* (59%) and 1 = *yes* (41%). Childhood/adolescence *history of abuse* was measured with three items from the Family Health History Questionnaire (Felitti et al., 1998). Participants reported how frequently they experienced verbal, physical, and sexual abuse while growing up (0 = *never*, 4 = *very often*). Higher average scores indicate more frequent experiences of abuse (*M* = .80, *SD* = .78). *Negative life events* were measured with a combination of items drawn from the Long-Term Difficulties Inventory (LDI) and the List of Threatening Experiences (LTE; Rosmalen et al., 2012), as well as the Psychiatric Epidemiology Research Interview (PERI) Life Events Scale (Dohrenwend et al., 1978). Participants reported whether they experienced difficulties or negative events in various life domains (e.g., relationship, health, finance) and how stressful these situations were (0 = *did not happen/does not apply to me*, 3 = *happened, very stressful*). They answered two sets of negative life events questions: one with 17 items pertaining to childhood/adolescence experiences, and the other pertaining to past-year experiences with the same 17 items, plus one additional question on difficulties with one's children. Higher average scores indicate more stressful negative life events growing up (*M* = .94, *SD* = .57) or in the past year (*M* = .96, *SD* = .47). *Experience of victimization* was measured with three items developed for this study asking whether participants experienced sexual assault, sexual harassment, and non-sexual harassment (0 = *no*, 1 = *yes*). Similar to negative life events, participants answered two sets of the same three questions concerning childhood/adolescence and past-year victimization experiences, respectively. Higher sum scores indicate more victimization experiences growing up (*M* = .48, *SD* = .84) or in the past year (*M* = .49, *SD* = .83).

Age was reported in years. *Gender* was self-identified as *woman*, *man*, or *another gender identity*. *Sexual orientation* was self-identified and coded as 0 = *heterosexual*, 1 = *sexual minority*. *Visible minority status* was self-identified and coded as 0 = *Caucasian/White*, 1 = *belonging to one or more visible minority groups*. *School year* was coded as 1 = *1st year*, through to 5 = *5th year or more*. *Faculty* was self-identified as in *Arts and Science*, or *Engineering and*

Computer Science, or *Fine Arts*, or *Business*. *International student status* was self-identified and coded as 0 = *no*, 1 = *yes*. *Subjective social status* was assessed by the one-item MacArthur Scale of Subjective Social Status (SSS; Adler et al., 2000). Participants rated their perceived rank relative to others in the society (1 = *worst off*, 10 = *best off*; *M* = 6.60, *SD* = 1.67). *Financial strain* was assessed by a seven-item scale adapted from the measure of Household Economics Strain (Pearlin & Schooler, 1978). Participants were asked how often they did not have enough money to afford certain items (e.g., clothing, food, transportation; 0 = *never*, 2 = *every month*; α = .88). Higher average scores indicate greater financial strain (*M* = .38, *SD* = .44).

Analytic Plan

First, we estimated unconditional latent growth models for each outcome in fall and winter. Model comparisons indicated that models with random cubic slopes fit the data best and suggested more pronounced changes in mental health in the first half of the semester, rather than the second half (a supplementary table presenting model comparison results is available on the Open Science Framework: https://osf.io/xvpcd/). Taking a piecewise latent growth curve modelling approach (Flora, 2008), we divided each semester into two pieces separated by midterm periods. This approach also allowed us to incorporate the winter break (an institution-wide closure in December, typically two weeks long) into the models. Next, we estimated unconditional piecewise growth models. For each mental health trajectory, we modelled one intercept and five linear slopes characterizing the initial levels at the start of the academic year and the rates of change per week across different periods of the academic year: intercepts (I; T1) for the start of the year, first (S_1; T1–W3) and second (S_2; W3–T2) slopes for the first and second half of the fall semester, third slopes (S_3; T2–T3) for the winter break, and fourth (S_4; T3–W9) and fifth (S_5; W9–T4) slopes for the first and second half of the winter semester. Finally, we tested conditional piecewise growth models by regressing growth factors on all baseline risk factors. Categorical risk factors were dummy coded. Analyses were conducted using Mplus 8.3 (Muthén & Muthén, 2017) software with maximum likelihood estimation with robust standard errors—allowing the inclusion of all available data and considered robust against non-normality (Kline, 2016). For model fit, we evaluated the chi-square (χ^2) test. As the test is sensitive to large sample sizes, we also considered other commonly used fit indices (Kline, 2016): the Steiger-Lind Root Mean Square Error of Approximation (RMSEA), the Bentler Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the Standardized Root Mean Square Residual (SRMR). Analysis codes are available on the Open Science Framework (https://osf.io/xvpcd/).

RESULTS

Tables 1 and 2 present descriptive statistics and correlations. Students generally reported higher positive affect and lower depressive and anxiety symptoms at the start of each semester compared to later points in each semester. Most risk factors were associated with mental health outcomes in expected directions. Autocorrelations suggested high levels of stability in positive affect (*r*'s = .63–.79), depressive symptoms (*r*'s = .70–.85), and anxiety symptoms (*r*'s = .62–.83) over time. Concurrent correlations among mental health outcomes ranged from small-to-moderate (positive affect and anxiety *r*'s from −.21 to −.33) to large (positive affect and depression *r*'s from −.47 to −.59; depression and anxiety *r*'s from .74 to .79).

Table 1
Emotional Well-Being and Distress Descriptive Statistics

	Fall								Winter							
	T1	W1	W2	W3	W4	W5	W6	T2	T3	W7	W8	W9	W10	W11	W12	T4
Positive affect																
M	3.02	2.89	2.73	2.62	2.58	2.53	2.54	2.71	2.83	2.71	2.63	2.61	2.55	2.61	2.61	2.71
SD	.82	.76	.76	.76	.76	.79	.79	.80	.83	.83	.82	.79	.83	.80	.81	.82
n	1004	933	899	885	864	845	831	836	775	727	718	721	700	674	666	683
Depressive symptoms																
M	.92	.92	1.02	1.10	1.09	1.14	1.14	1.11	.90	.92	.99	1.02	1.01	.98	1.00	1.02
SD	.58	.53	.55	.59	.58	.61	.61	.61	.62	.58	.59	.60	.60	.59	.60	.60
n	1003	932	897	883	861	844	829	836	772	727	715	718	698	673	663	677
Anxiety symptoms																
M	1.02	1.05	1.10	1.24	1.24	1.28	1.30	1.26	.89	.95	1.05	1.11	1.10	1.10	1.12	1.17
SD	.80	.75	.75	.83	.80	.84	.84	.85	.82	.80	.82	.82	.84	.83	.85	.83
n	1003	932	897	883	861	845	830	836	772	727	715	718	698	673	663	677

Note. Positive affect range: 1–5, depressive and anxiety symptoms range: 0–3.

Table 2
Bivariate Correlations between Risk Factors and Emotional Well-Being and Distress Outcomes

	r range[a]					
	Positive affect		Depressive symptoms		Anxiety symptoms	
	Min	Max	Min	Max	Min	Max
COVID-19 pandemic stress	–.01	.06	.04	.11	.09	.15
Mental health history	–.15	–.06	.17	.33	.22	.38
Stressful life experiences (growing up)						
History of abuse	–.15	.00	.22	.36	.16	.32
Negative life events	–.10	–.03	.25	.38	.27	.39
Experience of victimization	–.12	–.04	.13	.25	.16	.27
Stressful life experiences (past year)						
Negative life events	–.11	–.01	.30	.47	.33	.46
Experience of victimization	–.09	–.04	.16	.27	.17	.27
Age	–.03	.08	–.07	.03	–.08	–.02
Gender						
Man[b]	.02	.10	–.14	–.08	–.20	–.12
Woman	–.07	.02	.04	.11	.09	.15
Gender minority	–.14	–.05	.06	.15	.06	.16
Sexual orientation	–.12	–.03	.14	.21	.09	.20
Visible minority status	–.13	–.05	.01	.12	–.01	.05
School year	–.07	.02	–.05	.08	–.04	.11
Faculty						
Arts and Science[c]	–.07	.01	.01	.06	.00	.07
Engineering and Computer Science	–.04	.06	–.11	–.02	–.12	–.02
Fine Arts	–.11	.03	.06	.18	.01	.13
Business	.00	.11	–.11	–.04	–.06	.01
International student status	.00	.10	–.03	.05	–.06	.00
Subjective social status	.19	.28	–.22	–.16	–.14	–.08
Financial strain	–.11	–.02	.19	.29	.15	.27

Note. [a] *Range of bivariate correlations between the risk factors and outcome across waves.* [b] *Not included in the final model, considered reference group for other gender identities.* [c] *Not included in the final model, considered reference group for other faculties*

Average Trajectories of Positive Affect, Depressive Symptoms, and Anxiety Symptoms

The unconditional piecewise growth model for positive affect fit the data well, $\chi^2(109) = 373.31$, $p < .001$, RMSEA [90% CI] = .05 [.04, .06], CFI = .97, TLI = .96, SRMR = .04. Growth factor means, variances, and correlations are shown in Table 3, and average growth trajectory is shown in Figure 1 (panel *a*). In general, students reported moderate levels of positive affect at the start of the academic year (I = 3.03). Positive affect declined in the first half ($S_1 = -.08$) and increased slowly in the second half of the fall semester ($S_2 = .01$). A rebound in positive affect was observed over the winter break ($S_3 = .07$), which was followed by decreases in positive affect in the first half ($S_4 = -.04$) and slow increases in the second half of the winter semester ($S_5 = .01$, *p*'s < .05).

The unconditional model for depressive symptoms fit the data well, $\chi^2(109) = 317.06$, $p < .001$, RMSEA [90% CI] = .04 [.04, .05], CFI = .98, TLI = .97, SRMR = .02 (Table 3; Figure 1, panel *b*). Students on average reported low levels of depressive symptoms at the start of the academic year (I = .90). Depressive symptoms increased faster in the first half ($S_1 = .03$) and slower in the second half of the fall semester ($S_2 = .01$), then decreased during the winter break ($S_3 = -.08$). Depressive symptoms increased again in the first half ($S_4 = .02$, *p*'s < .01) and levelled off in the second half of the winter semester ($S_5 = -.001$, $p = .776$).

The unconditional model for anxiety symptoms fit the data well, $\chi^2(109) = 262.97$, $p < .001$, RMSEA [90% CI] = .04 [.03, .04], CFI = .98, TLI = .98, SRMR = .02 (Table 3; Figure 1 panel *c*). Students on average reported relatively low levels of anxiety symptoms at the start of the academic year (I = 1.00). Anxiety symptoms increased faster in the first half ($S_1 = .04$) and slower in the second half of the fall semester ($S_2 = .01$), then decreased during the winter break ($S_3 = -.13$), which was followed by faster increases in the first half ($S_4 = .03$) and slower increases in the second half of the winter semester ($S_5 = .01$, *p*'s < .05).

There were significant variances in the intercepts, suggesting meaningful interindividual differences from the average baseline that warranted further examination. Although variances of slopes were also statistically significant, they were small in magnitude. We used Wald tests to compare the magnitude of slopes within and between semesters. For all three outcomes, slopes for the first half significantly differed from slopes for the second half of that semester. In addition, the rate of decline in positive affect in the first half of the fall semester was significantly steeper than change in the first half of the winter semester. Rates of change in positive affect in the second half of both semesters were statistically equivalent. For depressive and anxiety symptoms, rates of change were similar in corresponding segments of the fall and winter semesters.

Risk Factors for Baseline Positive Affect, Depressive Symptoms, and Anxiety Symptoms

The conditional piecewise growth model for positive affect fit the data well, $\chi^2(394) = 746.88$, $p < .001$, RMSEA [90% CI] = .03 [.03, .03], CFI = .96, TLI = .96, SRMR = .03. Table 4 presents significant path coefficients from baseline risk factors to positive affect intercept. Prior mental health problems ($\beta = -.09$), younger ages ($\beta = .12$), belonging to one or more visible minority groups ($\beta = -.07$), and having lower subjective social status ($\beta = .27$, *p*'s < .05) were associated with lower initial levels of positive affect.

The conditional model for depressive symptoms fit the data well, $\chi^2(394) = 693.44$, $p < .001$, RMSEA [90% CI] = .03 [.02, .03], CFI = .97, TLI = .97, SRMR = .03 (Table 4). Prior mental health problems ($\beta = .18$), history of abuse ($\beta = .14$), past-year negative life events ($\beta = .30$), past-year victimization (.09), younger ages ($\beta = -.13$), self-identified sexual minority status ($\beta = .07$), lower subjective social status ($\beta = -.15$), and higher financial strain ($\beta = .10$, *p*'s < .05) were associated with higher initial levels of depressive symptoms.

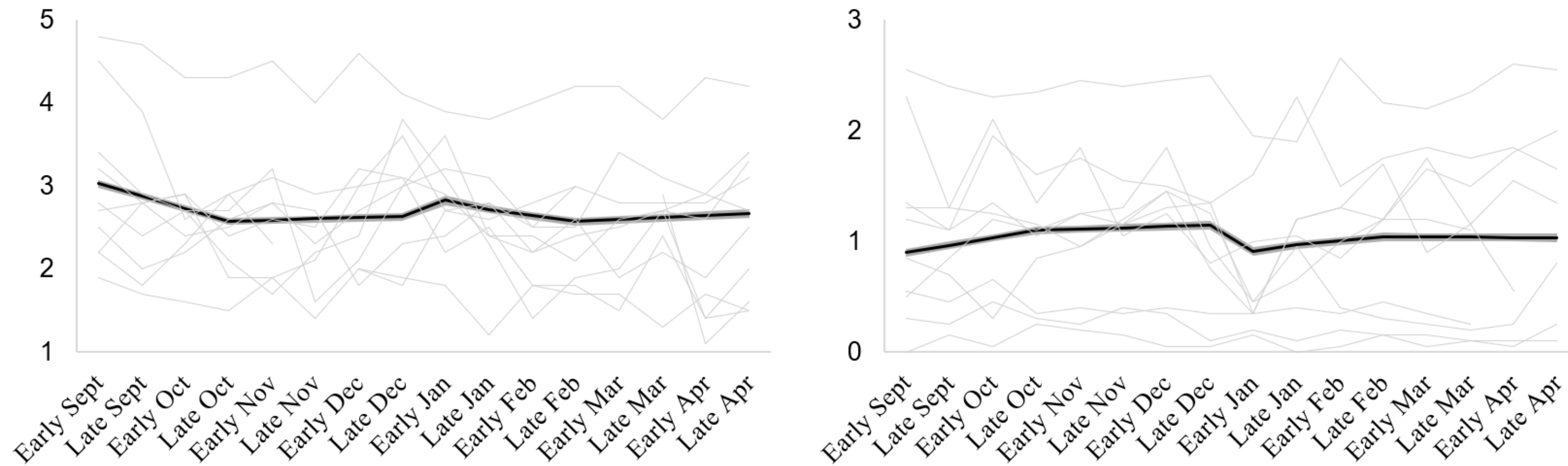
Table 3
Parameter Estimates of and Correlations between Growth Factors Based on the Unconditional Piecewise Latent Growth Models

	Growth factor estimates		Correlations among growth factor estimates				
	Mean	Variance	I	S_1	S_2	S_3	S_4
Positive affect							
I	3.03*	.463*					
S_1	−.08*	.007*	−.45*				
S_2	.01*	.002*	−.03	−.15			
S_3	.07*	.021*	.12	−.39*	−.21*		
S_4	−.04*	.004*	−.11	.16	−.03	−.51*	
S_5	.01*	.002*	−.07	.17	.02	−.29*	−.18
Depressive symptoms							
I	.90*	.249*					
S_1	.03*	.003*	−.29*				
S_2	.01*	.001*	−.01	−.25*			
S_3	−.08*	.012*	.06	−.35*	−.24*		
S_4	.02*	.003*	−.14*	.17*	−.08	−.50*	
S_5	.00	.001*	−.02	.02	.09	−.21*	−.17
Anxiety symptoms							
I	1.00*	.468*					
S_1	.04*	.007*	−.29*				
S_2	.01*	.003*	−.10	−.17			
S_3	−.13*	.030*	.06	−.42*	−.29*		
S_4	.03*	.006*	−.10	.31*	−.07	−.58*	
S_5	.01*	.002*	.06	−.22*	.15	−.15	−.20*

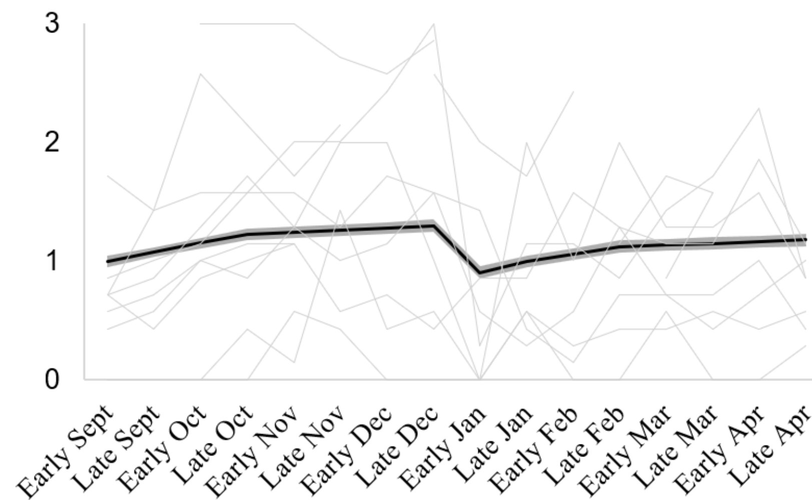
*Note. N = 1004. I = Intercept (T1). S_1 = Slope 1 (T1–W3). S_2 = Slope 2 (W3–T2). S_3 = Slope 3 (T2–T3). S_4 = Slope 4 (T3–W9). S_5 = Slope 5 (W9–T4). Time is coded in weeks. Unstandardized means and variances are reported. *$p < .05$.*

Figure 1

Trajectories of Positive Affect, Depressive Symptoms, and Anxiety Symptoms Across the Academic Year



c) Anxiety Symptoms



Note. Black lines represent model estimated average trajectories; dark gray shaded areas represent confidence bands around the average trajectories (calculated according to steps laid out in Howard, 2021); light gray lines represent raw data from a random sample of 10 students.

The conditional model for anxiety symptoms fit the data well, $\chi^2(394) = 626.18$, $p < .001$, RMSEA [90% CI] = .03 [.02, .03], CFI = .98, TLI = .98, SRMR = .03 (Table 4). Prior mental health problems (β = .21), history of abuse (β = .11), past-year negative life events (β = .29), past-year victimization (β = .08), younger ages (β = −.11), self-identifying as a woman (β = .08) or gender minority (β = .08), and higher financial strain (β = .09, *p*'s < .05) were associated with higher initial levels of anxiety symptoms.

Table 4
Predictive Path Coefficients of the Conditional Piecewise Latent Growth Models

	Positive affect		Depressive symptoms		Anxiety symptoms	
Predictor of intercept	β	*p*	β	*p*	β	p
COVID-19 pandemic stress	.05	.142	−.03	.306	.01	.721
Mental health history	**−.09**	**.007**	**.18**	**< .001**	**.21**	**< .001**
History of abuse (growing up)	.01	.749	**.14**	**< .001**	**.11**	**.001**
Negative life events (growing up)	.02	.523	.02	.649	.07	.061
Victimization (growing up)	−.01	.754	−.06	.106	−.03	.433
Negative life events (past year)	−.05	.167	**.30**	**< .001**	**.29**	**< .001**
Victimization (past year)	−.01	.801	**.09**	**.003**	**.08**	**.015**
Age[a]	**.12**	**< .001**	**−.13**	**< .001**	**−.11**	**< .001**
Woman[b]	−.04	.220	.02	.448	**.08**	**.008**
Gender minority[b]	−.05	.088	.05	.101	**.08**	**.017**
Sexual minority	−.02	.480	**.07**	**.017**	.01	.634
Visible minority	**−.07**	**.017**	.01	.751	−.01	.584
School year	−.03	.339	−.01	.637	−.02	.588
Engineering and Computer Science[c]	.01	.775	.03	.403	.03	.430
Fine Arts[c]	.02	.538	.04	.183	.01	.849
Business[c]	.06	.101	.01	.802	.05	.103
International student	.03	.297	.03	.213	.00	.875
Subjective social status	**.27**	**< .001**	**−.15**	**< .001**	−.05	.083
Financial strain	−.01	.624	**.10**	**.001**	**.09**	**.003**

Note. All baseline risk factors are included in each model simultaneously. Standardized estimates are reported.
[a] Grand mean centered. [b] Reference group is man. [c] Reference group is Arts and Science.

DISCUSSION

The current study identified *when* in the academic year students experience the most distress and *who* was at risk for experiencing elevated distress. The results converged to identify the first half of the semester as a key period for intervention. Students' positive affect decreased while depressive and anxiety symptoms increased in the first half of each semester; mental health remained relatively stable in the second half of each semester. Mental health generally improved across the winter break. Past studies surveying students only at the starts and ends of semesters found higher levels of mental health problems at the end of a semester (Barker et al., 2018). Our results show that the acceleration occurs in the early part of the semester, corresponding with those of two other studies that also found that the greatest rate of change in mental health occurred in the first half of a semester and that the winter break was a period of recovery (Milyavskaya et al., 2014; Wang et al., 2017). Together, this growing body of research points to the early weeks of semesters as key points for intervention. Some institutions have implemented mid-semester breaks to reduce stress, with students reporting mixed feelings about them (Agnew et al., 2019). Besides such breaks, orientation events that encourage engagement in university programming could be extended across the first weeks of the semester, and stress-management programming that often targets final exams could be delivered early in the semester as well. Students may be more likely to participate in such programs when academic workload is relatively low, which may help prevent mental health declines in the first few weeks of a semester.

Our results also indicate that distress patterns may be differentiated by the vulnerabilities undergraduate students bring with them, and that mental health disparities may persist over the academic life cycle. Examining a comprehensive list of established risk factors, our study showed that different students began their academic year at different starting points depending on their unique circumstances. Moreover, high levels of rank-order stability across waves, low levels of variability in slopes, and greater variability in intercepts for all mental health outcomes emphasize the importance of tailored programming for vulnerable groups from the outset of the semester. For example, at the academic year start, student mental health history was related to all three indicators of mental health, and stressful life experiences were related to student mental health symptoms (but not their emotional well-being). Among sociodemographic characteristics, our study identified age, gender, minority status, and socio-economic status as key risk factors for students' mental health at the start of the academic year. Consistent with past research, younger age was associated with lower emotional well-being and higher symptoms. In their study of Botswana university students, Monteiro et al. (2014) found that older students were more likely to use problem-focused coping strategies than younger students. Better emotional well-being and lower distress among older students may be a result of more effective coping under stressful situations. Consistent with some past research, students who self-identified as women reported higher levels of anxiety. Gender minority, sexual minority, and visible minority students reported lower positive affect and more depressive and anxiety symptoms, supporting the minority stress model (Meyer & Frost, 2013). Subjective social status predicted both emotional well-being and distress, and objective financial strain predicted distress (but not positive affect). Although many of these factors are non-modifiable, programs aiming at promoting mental health may consider incorporating students' characteristics in their designs. While many institutions have programs dedicated to some of these groups, they should look beyond orientations to welcome and introduce students to services offering ongoing targeted supports across the semester.

In addition to the importance of the current findings for programming, our study provides specific directions for future research. First, in documenting patterns of change in emotional well-being and distress, our results show the importance of moving beyond static "snap shots" of student mental health at unspecified times of

the year that cross-sectional studies provide. Student mental health is variable, and future research should account for these patterns. Second, the comprehensive set of risk factors assessed in our study explained moderate amounts of variability (36% and 38% of variability in anxiety and depressive symptoms intercepts respectively), but this leaves more variability unaccounted for. Future research could examine how co-occurring stressors, especially those related to the academic environment, interact with the academic cycle to compromise mental health. Third, to extend the benefits of the current study further, future studies should oversample proportionately small groups on campus to better understand their experiences. Although our study relied on a large representative sample of university students with a strong retention rate across waves, we only examined students from a single university, with the group sizes for minority groups too small to allow multigroup comparisons of mental health trajectories and effects of risk factors. Finally, the generalizability of our results may be limited as our data were collected during the COVID-19 pandemic. Our study followed students across an entire academic year that was delivered almost entirely online. Locally, students experienced upticks in COVID-19 cases and associated social distancing restrictions at various timepoints. Students living in other areas had different experiences, and these experiences are markedly different from previous and future cohorts. Future research is needed to test whether comparable cyclical patterns in mental health would be identified among students in other areas during the pandemic or current students in largely in-person learning contexts without pandemic restrictions. Moreover, although in our study mental health at the start of the academic year mostly did not vary as a function of pandemic stress, we cannot rule out the possibility that there are long-term consequences of the pandemic on students' mental health and broader university experiences in general. Future research should follow up on cohorts whose learning experiences were impacted by the pandemic.

The results of the current study highlight the need for prospective multiwave studies to accurately capture the complex heterogeneity that characterizes university students' emotional well-being and distress. As our results reveal, doing so is important for planning and service delivery on post-secondary campuses with respect to when in the academic year to intervene and with respect to the needs of particular groups of students.

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