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College Graduation in Students with and without Disability: Links with Stress and Coping Trajectories during COVID-19

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Abstract
The COVID-19 pandemic posed significant challenges for many college students, particularly those with disabilities. However, little is known about how students' stress and coping evolved during the pandemic or whether these changes influenced academic outcomes. Using a person-oriented approach, this study examined trajectories of stress and coping across the pandemic and their association with college graduation in a four-year longitudinal cohort of 1,348 students attending 10 colleges in Québec, Canada. Of the participants, 45% reported a physical or psychological disability. Stress and coping were assessed in spring 2020 (Time 2), 2021 (Time 3), and 2022 (Time 4), pre-pandemic control variables were measured in fall 2019 (Time 1), and graduation data were obtained from official records in fall 2023 (Time 5). Three key findings emerged. First, most students experienced increasing stress from Time 2 to Time 3, followed by a subsequent decline after Time 3. Over the same period, proactive coping strategies decreased, whereas defensive coping strategies increased. Second, students with disabilities were disproportionately represented in trajectories characterized by high stress and high defensive coping and were underrepresented in trajectories marked by high proactive coping. Third, after controlling for pre-pandemic academic adjustment and other personal characteristics (Time 1), membership in a high defensive coping trajectory was associated with lower odds of graduating at Time 5, regardless of disability status. These findings highlight the importance of promoting adaptive coping strategies to support academic persistence and reduce dropout risk among students with and without disabilities.

Keywords COVID-19 · Stress and coping · Students with disability · College graduation

The postsecondary diploma continues to serve as a springboard for career advancement, holding promise for future well-being, health, and prosperity. Several studies (Kim et al., 2023; Lawrence, 2017) have found positive and longitudinal associations between a postsecondary diploma and both health and income. Unfortunately, obtaining this diploma is much harder for students who must cope with daily obstacles due to physical or psycho-

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logical disabilities (e.g., motor or organic impairment, attention disorder, mental health problem, learning disability). For example, in the United States, "about half (49.5%) of students with disabilities who enrolled at a four-year college in 2011 completed a bachelor's degree within six years versus roughly 68% of students without disabilities" (National Center for Education Statistics, 2020). In the province of Québec, Canada, the 2019 graduation rate for students with disabilities who were newly admitted to a college and enrolled in an adapted service in 2015 was 52.7% compared to 63.6% for other students (*Ministère de l'Enseignement Supérieur du Québec*, 2023).

Students with disabilities faced considerable challenges adjusting to college during the COVID-19 pandemic, while postsecondary institutions struggled to provide adequate support (McMaughan et al., 2021; Zhang et al., 2020). Many scholars have argued that the multiple disruptions associated with the pandemic—including campus closures, the transition to online learning, remote service delivery, mandatory public health measures, and curfews—generated substantial stress and affected students' coping capacities (Dagorn & Moulin, 2025). Both qualitative and quantitative studies indicate that the absence of in-person instruction, reduced opportunities for hands-on learning and real-time problem solving, diminished contact with instructors and peers, concerns about the fairness of assessment practices, and increased academic demands are among the factors that adversely affected stress and coping during the pandemic, particularly among students from diverse backgrounds (Aristovnik et al., 2020; Williams et al., 2024).

At the same time, emerging evidence suggests that patterns of adaptation to the pandemic were not uniform across students. For example, a study by Larose et al. (2024a) examining trajectories of academic and social adjustment during the early stages of the pandemic found substantial heterogeneity in students' experiences. Approximately 4% of students exhibited improvements in their academic and social adjustment, whereas 9% to 11% followed declining trajectories. The majority (84%–87%) showed stable trajectories, which could be either consistently positive or consistently negative. The study also found that students with pre-existing mental health conditions were more likely to belong to at-risk trajectories, characterized by persistently poor adjustment or declining adjustment over time.

Taken together, these findings suggest that pathways to graduation became increasingly challenging during the COVID-19 pandemic, that trajectories of stress and coping may be heterogeneous, and that students with disabilities may be at greater risk of following maladaptive trajectories. However, few longitudinal studies have used person-oriented approaches to examine heterogeneity in stress and coping trajectories among students with disabilities during the pandemic or to investigate how these adaptation processes relate to graduation outcomes.

Accordingly, our overall objective was to describe trajectories of stress and coping among college students with and without disabilities during the COVID-19 pandemic and to determine whether trajectory membership predicted graduation. To provide context for our study, we first describe the pandemic conditions that prevailed during our assessment of stress and coping. We then review the international literature on the potential effects of the pandemic on postsecondary graduation among students with disabilities and critically examine the limited longitudinal research that has investigated the roles of stress and coping during this period.

Assessment of Stress and Coping and COVID-19

Our first assessment of stress and coping took place in Spring 2020 (Time 2), during the initial phase of the COVID-19 pandemic in Quebec. Following the closure of postsecondary institutions on March 16, 2020, students experienced an abrupt transition to remote learning, widespread disruption of academic activities, and reduced access to support services, particularly students with disabilities (Gouvernement du Québec, 2021a; Newswire, 2020). At that time, vaccines were not yet available. The second assessment was conducted in Spring 2021 (Time 3), when most postsecondary instruction remained online. Vaccination had begun and was progressively expanded to the general adult population, including college students, although public health restrictions were still in place (Gouvernement du Québec, 2021b). The third assessment took place in Spring 2022 (Time 4), when most students had received two or more vaccine doses and postsecondary institutions had largely resumed in-person instruction. Although COVID-19 continued to circulate, support services and campus activities had largely returned to normal operations (Gouvernement du Québec, 2022; Institut National de Santé Publique du Québec, 2022).

College Graduation

The causal relationship between coping with the successive pandemic waves and graduation from college is difficult to establish. In an exceedingly exhaustive analysis of student access to post-secondary studies during the pandemic, the National Student Clearinghouse Research Center (NSCR, 2021) examined data on over 9.2 million American students and found that college enrollment fell by 4% between 2019–2020 and 2020–2021, a trend that affected the vast majority of postsecondary institutions across the US but was more pronounced in first-year students and community colleges, with 16.1% and 22.7% lower enrollments, respectively.

Data from the Beginning Postsecondary Students Longitudinal Study in over 37,000 students enrolled at two-year and four-year public institutions in the US (Haynes et al., 2024) showed a 23% non-completion rate after three years for the first COVID-19 cohort (2019–2020), of which 33% were enrolled in two-year college programs and 15% in four-year college programs. Within three years, 73% of these first-time enrollees reported increased stress or anxiety, with 20% job loss, 19% return to their permanent address, 15% financial problems, and 12% difficulty accessing basic groceries. Moreover, from 30 to 40% of these students reported that their grades were lower than expected due to the disruptions caused by the pandemic.

Students at 21 US colleges and universities were surveyed on their needs, safety, and well-being during the pandemic (Blankstein et al., 2020). At the end of year 2020–2021, almost 20% of them were not planning to re-enroll due to financial constraints, perceived lower educational value of postsecondary attainment, and difficulty with online learning. Of those who planned to re-enroll, nearly 40% were uncertain about their timeline for graduating.

In France, cohort analyses from 2012 to 2022 showed a 3.7% reduction in university re-enrollments for the first cohort affected by the pandemic, equivalent to that observed for the entire decade before pandemic onset. This reduction was even more marked for students in bachelor programs, international students, and males (Dagorn & Moulin, 2025). Results

also showed that the first COVID-19 cohort had 7.4% lower odds of graduating (according to a probabilistic model) than the 2019 cohort, and that the determinants for re-enrollment and graduation were based more on personal factors and perceptions of the pandemic situation than on institutional or teaching and learning factors (Dagorn & Moulin, 2025). A study in Brazil corroborates these results (Colpo et al., 2022).

Other pandemic studies have shown that disruptions due to online migration lowered student motivation and learning engagement, particularly for students with special needs, who tended to worry more about the quality of their learning, academic workloads, access to classroom materials, and their ability to pass exams (Benner et al., 2024). Some studies showed that students who received more virtual instruction during the pandemic reported higher levels of academic worry, lower well-being, and lower grades in the long-term than students who received more in-person instruction (Christ & Gray, 2022; Darling-Aduana et al., 2022).

Taken together, these findings suggest that the pandemic, through its effects on learning, teaching, student services, and students' mental health, academic worry, and grades, disrupted the educational pathway, thereby affecting students' odds of graduating. However, the above-reviewed studies addressed mainly issues of access and intentions to persevere rather than graduation as such, and none documents differentiated graduation rates for students with and without disability. Furthermore, only a few studies have systematically examined empirical associations between stress and coping strategies in students across multiple pandemic waves and subsequent graduation rates. Next, we present the underlying theoretical framework (Lazarus & Folkman, 1984) for our study. We then look at some relevant studies that documented changes in stress and coping during the pandemic and their associations with student adaptation to postsecondary institutions.

Trajectories of Stress and Coping During COVID-19

In the present study, we measured perceived stress as well as three coping strategies used during the COVID-19 pandemic: (1) engagement in adaptive activities, such as physical exercise or spending quality time with family; (2) engagement in maladaptive activities, such as increased alcohol and drug consumption or excessive online gaming; (3) denial-based coping, such as downplaying the pandemic's impact on physical health or perceiving societal responses as exaggerated. The selection of these indicators is consistent with the propositions of the transactional model of stress and coping proposed by Lazarus and Folkman (1984), as well as with recent empirical research on coping during the COVID-19 pandemic. According to this model, individuals' subjective appraisal of a stressful event (e.g., the COVID-19 pandemic) is a key determinant of the level of stress experienced. This appraisal process involves two sequential and interrelated stages. Primary appraisal refers to the evaluation of the significance of the event for one's well-being, typically in terms of threat, loss, or challenge. Secondary appraisal involves the evaluation of one's coping resources and perceived ability to manage the demands of the situation, including both personal capacities and available social or institutional support. Following these appraisal processes, the resulting level of perceived stress influences the coping strategies individuals are likely to adopt. Importantly, coping is not inherently adaptive or maladaptive; rather, its effectiveness depends on the fit between the chosen strategy and the characteristics of the situation, including its controllability. In this regard, individuals who appraise the pandemic

as a challenge may engage in proactive, problem-focused or emotion-regulating adaptive activities, such as physical exercise, relaxation practices, or spending time outdoors with family (Gordon-Smith et al., 2024; Umucu & Lee, 2020). Conversely, individuals experiencing higher levels of perceived threat or loss may be more likely to engage in avoidant or defensive coping strategies, including substance use or addictive gaming behaviors (Alimoradi et al., 2024).

Although cross-sectional associations among perceived stress, proactive and defensive coping strategies, and student health and learning during the pandemic are well documented (Guardino et al., 2025; He, 2023; Li & Chen, 2023), studies have largely neglected to describe their trajectories based on longitudinal data (see Brown & Papp for an exception) and using a person-oriented approach, and to our knowledge, none has explored the relationships between these trajectories and graduation rates in students with disabilities. In fact, we found only three longitudinal studies on coping during the pandemic, and they did not include trajectories and/or did not focus on students with disabilities.

Brown and Papp (2024) conducted a longitudinal study in a normative population of college students at five measurement times, including pre- and post-pandemic assessments. Using multilevel growth curve modelling, they showed that students exhibited slightly lower levels of stress at pandemic start compared to pre-pandemic, with moderately increasing stress in subsequent months without attaining initial levels. At the same time, proactive coping strategies (e.g., "I successfully solved problems that came up") declined abruptly once the pandemic hit, and this decline accelerated thereafter. This suggests that students' coping strategies deteriorated somewhat, even as they felt less stressed by the pandemic. Wang et al. (2024), in a longitudinal study with a normative population of college students, included two measurement times (2016–2017 and April–May 2020). They showed that students' use of avoidance coping strategies and perceived stress levels increased between the two measurement times. Moreover, attitudes toward seeking professional and psychological help improved, while self-reported levels of resilience, subjective happiness, and life satisfaction decreased. Using latent profile analysis, they created three groups of students (active, withdrawal, and undifferentiated copers) and found increased risk of negative mental health symptoms and poorer academic performance in response to pandemic stress for the withdrawal copers. Dvorsky et al. (2022) assessed stress and coping strategies in students with and without ADHD in May–June, July–August, and November–December 2020 and found that students with ADHD used less positive coping strategies than students without ADHD during the first pandemic year despite reporting lower stress and fewer worries about the pandemic. In addition, the use of proactive strategies during the pandemic by students with ADHD (e.g., getting a good night's sleep, exercising, eating healthier, engaging in more family activities) was found to lower their levels of worry, stress, substance use, and mental health symptoms after pandemic onset.

The Present Study

Although previous research on stress and coping trajectories has primarily relied on variable-centered approaches (e.g., growth curve modeling), the present study adopts a person-oriented perspective grounded in the transactional model of stress and coping (Lazarus & Folkman, 1984). From this perspective, stress is not viewed as a uniform response to a given event but rather as the outcome of dynamic person–environment transactions shaped by

individuals' cognitive appraisals and coping processes. Consequently, individuals exposed to similar stressors may experience and respond to them differently, resulting in distinct patterns of stress and coping over time. A person-oriented approach is therefore particularly well suited to identifying subgroups of students who follow different adaptation trajectories during major life disruptions such as the COVID-19 pandemic.

The first objective of this study was therefore to identify trajectories of perceived stress, proactive coping, and defensive coping among college students with and without disabilities throughout the COVID-19 pandemic in Quebec. Given the limited number of longitudinal studies adopting a person-oriented approach during the pandemic, no specific hypotheses were formulated regarding the number or shape of the trajectories. However, based on evidence suggesting that students with disabilities experienced greater adjustment difficulties during this period, we hypothesized that they would be overrepresented in trajectories characterized by higher levels of stress and greater reliance on defensive coping strategies.

The second objective was to examine whether trajectory membership predicted college graduation and whether these associations varied according to disability status. As reviewed above, the COVID-19 pandemic appears to have had differential effects on stress experiences and coping resources of students with disabilities. Previous research has also shown that proactive coping strategies are associated with more favorable academic outcomes, whereas defensive coping strategies are linked to greater adjustment difficulties. Taken together, these findings lead us to hypothesize that distinct stress and coping trajectories during the pandemic are associated with students' likelihood of completing college and that these associations may be especially strong among students with disabilities.

Finally, to better isolate the contribution of membership in the different stress and coping trajectories, initial adjustment to college, gender, parental education and income, and disability status were included as control variables in our predictive models. Prior research has consistently demonstrated meaningful associations between these variables and post-secondary graduation, thereby warranting their inclusion as covariates (Deschenaux et al., 2022; Statistics Canada, 2026; Van Bussel & Fecteau, 2022).

Method

Participants and Procedure

The participants in the present study were part of an ongoing longitudinal study (the ESH-Transition project) begun in fall (October) 2019 and involving 10 colleges in Québec (32.9% Montreal; 35.3% Québec City, 31.8% Central Québec). The initial aims were to examine the effects of college disability services and accommodations on the academic trajectories of students with disabilities and to compare these trajectories with those of students without disabilities. After the COVID-19 outbreak, we included a pandemic component to examine associations between experience of the pandemic, adjustment to college, and graduation rates for all participant students. This study was approved by the ethics committee of Laval University, and all participants gave their informed consent.

For the recruitment strategy in fall 2019, we sent an email invitation to all newly enrolled students at the 10 participating colleges. The typical age of newly enrolled college students in Québec is 17–18 years (Ministère de l'Enseignement supérieur, 2025). In addition,

we used targeted, in-person invitations for students registered with the college's disability office. This recruitment approach has allowed us to target new college entrants while over-representing students with disabilities.

In our study, we used five points in time. At Time 1 (pre-pandemic: October–November 2019), 1,826 students (M_{age} = 18.2 years, SD = 3.8; 78.6% female) agreed to participate in the study and complete an online questionnaire. They were enrolled in different programs (preuniversity: 64.8%, technical: 35.2%) and were in their first term. Of the initial sample, 45% disclosed one or more disabilities (see Measures section for details).

Participants were invited to complete a second online questionnaire in April 2020 (Time 2) at the peak (in terms of positive cases) of the first COVID-19 wave in Québec, approximately one month before the end of their first college academic year. About 79% of the initial sample (1,435 students) agreed to complete the second questionnaire. Sample characteristics were statistically similar for Times 1 and 2 in terms of gender, disability status, study region, study program, parental income, and parental education (all Chi-square $ps > .05$). Moreover, the participants who withdrew from the study at Time 2 presented similar Time 1 academic adjustment scores to those who remained (t-test $p > .05$).

In April 2021 (Time 3), as Québec was battling a third COVID-19 wave and most students were completing their 2020–2021 academic year entirely online, we contacted all remaining participants. A total of 1,242 students (87% from Time 2; 68% from Time 1) agreed to complete a third online questionnaire. Like the Time 2 sample, the Time 3 sample did not differ from the initial sample on either our descriptive variables (all Chi-square $ps > .05$) or the Time 1 academic adjustment score (t-test $p > .05$).

In April 2022 (Time 4), as Québec suffered a sixth COVID-19 wave and students resumed face-to-face learning, we contacted all remaining participants. A total of 1,175 students (95% from Time 3, 82% from Time 2, and 64% from Time 1) agreed to complete a fourth online questionnaire. The Time 4 sample did not differ from the initial sample on either our descriptives variables (all Chi-square $ps > .05$) or the Time 1 academic adjustment score (t-test $p > .05$).

In December 2023 (Time 5), we asked the 10 participating colleges, with the consent of all student participants at Time 1, to provide us with the graduation data for these students.

Measures

Perceived Stress and Coping Strategies

Perceived stress and coping strategies were measured at Times 2, 3, and 4 with sections B and C of the COVID-19 Questionnaire (QCovid-19). Inspired by Lazarus and Folkman's (1984) transactional stress model, the questionnaire was developed and initially validated by our team (see Larose et al., 2024b). In Section B (6 items), students reported their perceptions of loss (2 items, e.g., "I must sacrifice many important activities in my life due to the pandemic"), threat (2 items, e.g., "I am afraid that I will have to live differently because of the pandemic"), and challenge (2 items, e.g., "I see the pandemic as an important challenge in my life") with respect to the pandemic situation. Responses were rated on a Likert scale from 1 (Completely disagree) to 5 (Completely agree). In section C (12 items), students rated four coping strategies that they may have used during the different pandemic waves:

doing adaptive activities, such as physical exercise or spending quality time with family (4 items); doing maladaptive activities, such as increased alcohol and drug consumption or online gaming (2 items); seeking information about the pandemic, such as watching government briefings and consulting evidence-based websites (3 items); and using denial, such as downplaying the pandemic's impact on physical health and viewing society as alarmist (3 items). Responses were rated on a Likert scale from 1 (Completely disagree) to 5 (Completely agree).

The QCovid-19 was originally conceptualized as comprising three primary factors: Perceived Stress (6 items from Section B), Proactive Coping (7 items reflecting engagement in adaptive activities and seeking preventive information), and Defensive Coping (5 items reflecting engagement in maladaptive activities and the use of denial). To evaluate the psychometric properties of the QCOVID-19, we conducted a longitudinal confirmatory factor analysis (CFA) within a structural equation modeling (SEM) framework. We compared both three-factor and four-factor models, as the Proactive Coping items can be conceptualized as two distinct dimensions: Proactive Activities (4 items) and Seeking Preventive Information (3 items). At Time 2, the three-factor model showed some shortcomings in model fit, whereas the four-factor model demonstrated a satisfactory overall fit to the data (CFI = .914, TLI = .896, RMSEA = .058, SRMR = .068). The four-factor model was selected and showed similarly acceptable fit at Times 3 and 4.

Longitudinal measurement invariance was tested with the alignment method (Asparouhov & Muthén, 2014). This procedure tests invariance between sequential time points and provides a R^2 value for loading (λ) and intercept (ν) stability, which roughly equate to metric and scalar invariance, respectively. R^2_λ values exceeded .99 for all Time 2 vs. Time 3 and Time 3 vs Time 4 alignment, except for the Defensive Coping factor loadings, which yielded an R^2_λ value of .806 for the latter comparison. R^2_ν followed the same pattern, except for Time 3 vs. Time 4 of the Defensive Coping factor intercepts, which yielded an R^2_ν of .94. The alignment method showing consistent stability in almost all factor loadings and intercepts, these findings support the validity and longitudinal stability of the four-factor structure of the QCOVID-19. In addition, all four factors demonstrated good internal consistency, with Cronbach's alpha coefficients exceeding .80 at each assessment point.

For the purposes of the present study, however, the Seeking Preventive Information factor was not included in the subsequent analyses. This decision was made on theoretical grounds, as information-seeking behaviors were expected to be most relevant during the early stages of the COVID-19 pandemic, when knowledge about the virus and recommended preventive measures was still limited. Consequently, the trajectory analyses focused on the remaining three factors: Perceived Stress, Proactive Activities, and Defensive Coping.

College Graduation

The college graduation rate was calculated at Time 5 (December 2023). In Québec, the time to graduate is theoretically two years for the preuniversity program and three years for the technical program. Therefore, the graduation data were compiled two years and one term after the theoretical time to graduate for the preuniversity program (2019–2021) and one year and one term after the theoretical graduation time for the technical program (2019–2022). To graduate, students must have completed all the courses in the program and fulfilled all the academic requirements (e.g., internships and French exams). In the sample

retained for this study (before excluding missing data on stress and coping), the graduation rate for December 2023 is 63.5%. As expected, students with disability present much lower graduation rates than students without disability (51.6% vs. 71.6%; $X^2 = 48.98$, $p < .001$). This rate for students with disability is comparable to that reported in 2019 for the 2015 cohort of college students in Québec who were enrolled in an adapted service (52.7%) (*Ministère de l'Enseignement Supérieur du Québec*, 2023).

Control Variables

Adjustment to college was assessed at Time 1 using the French version of the Student Adaptation to College Questionnaire (SACQ-F) (Larose et al., 1996). The questionnaire contains 23 items that measure three dimensions: academic adjustment (10 items, e.g., "I am satisfied with my academic performance in college"; $\alpha = .80$), social adjustment (6 items, e.g., "I am somewhat satisfied with my social life at college"; $\alpha = .85$), and emotional adjustment (7 items, e.g., "I find it very hard to deal with the stress of college life"; reverse coded, $\alpha = .76$). Responses were rated on a Likert scale from 1 (Completely disagree) to 5 (Completely agree). The validity and reliability of the SACQ-F have been well demonstrated (Larose et al., 1996). Given the high correlations across the three dimensions of the SACQ-F, and to simplify the results, we use the global college adjustment score in the present article, expressed as the average score on the academic, social, and personal/emotional dimensions ($\alpha = .83$).

Disability status and *disability types* were self-reported by students at Time 1. The following prompt was used: "A student is in a situation of disability when a relatively permanent physical, cognitive, or emotional condition limits their ability to fully achieve their academic potential. Do you consider that you are in a situation of disability?" Response options were "Yes," "No," "Maybe," and "Prefer not to respond." Students were then presented with a list of 11 disabilities and asked to check a box next to those that corresponded to their situation. For each box checked, students were prompted to respond either "Yes" or "No" to indicate whether the disability had been diagnosed by a professional. The following 11 disabilities were listed: hearing impairment, motor/mobility impairment, visual impairment, learning disability (e.g., dyslexia), language/communication disorder, attention deficit disorder with or without hyperactivity (ADD/ADHD), neurological disorder (e.g., epilepsy, traumatic brain injury), organic disorder (e.g., cancer, Crohn's disease), mental health disorder (e.g., anxiety disorder, mood disorder), autism spectrum disorder, and other condition(s) specified by the student. Of the initial sample, 45% disclosed at Time 1 a disability that had been diagnosed by a professional. The most frequently disclosed disabilities were mental health disorders (MHD) (38%), followed by attention deficit disorder with or without hyperactivity (ADD/ADHD) (23%) and learning disorders (LD) (20%), with only 1% to 2% for the remaining options. Note that 37% of students with disability reported more than one disability. Below in this article, the variable *disability type* refers to the three main categories observed in our study (ADD/ADHD, MHD, and LD).

Gender, parental income, and parental education were reported by students at Time 1. We assigned the value 0 to men and 1 to women. Of the participants, 1.3% identified as another gender category ("Other") and were excluded from all analyses involving associations between this variable and other study variables. *Parental income* was estimated on a 5-point scale (1 = below $30,000 CND; 5 = $130,000 CND or more). Average parental income

in Canada was $59,300 CND in 2021 (*Statistique* Canada, 2023). *Parental education* was estimated as the level of formal education completed by each parent. To identify first-generation college students, we assigned the value 0 for non-completion of a post-secondary degree by both parents and 1 for completion of a post-secondary degree by at least one parent.

Analysis plan

Missing Data

Attrition is a common problem in longitudinal research (Ployhart & Vandenberg, 2010). In our study, some students did not participate at all measurement times. The percentage of missing data, including attrition, varied from 0.4% (T1) to 26.8% (T4 vs. T1). Little's (1988) MCAR test showed that the data were likely missing completely at random, χ^2 [1] = .005, p = .943. Consequently, and given the large sample size, we chose to exclude cases with missing values (pairwise deletion), and we proceeded to analyze the remaining complete data (varying from 1,175 to 1,348 participants).

Main Analysis

Our first research objective was to describe student trajectories of stress and coping between the first and sixth COVID-19 waves. To do so, we estimated semiparametric mixture models using the SAS TRAJ procedure (Nagin, 1999). Three separate trajectory analyses were performed on stress, proactive coping, and defensive coping scores at waves 1, 3, and 6. The optimal number of groups was determined by estimating models with one, two, three, four, and five groups as suggested by Nagin (2005). Trajectory shapes were determined by estimating models with linear and quadratic trajectory shapes (or parameters). Models that best fit the data were determined according to the Bayesian Information Criterion (BIC), calculated as follows:

$$\mathrm{BIC} = -2\log(\mathrm{L}) + \log(\mathrm{n})\mathrm{Xk}$$

where L is the model's maximized likelihood, n is the sample size, and k is the number of parameters in the model (Nagin, 1999). Although there are no clear guidelines for interpreting BIC magnitude, it has been proposed that the optimal model has the maximum BIC value. Because BIC is always negative, the maximum BIC is the least negative value. The procedure also calculates the probability for each candidate of belonging to each group, based on observed longitudinal patterns (Nagin, 1999). Moreover, it determines the assigned trajectory group membership based on the highest classification probability across groups (i.e., the maximum probability rule). Taken together, these two estimates (BIC and probabilities) provide information on model fit. Hence, individuals belonging to a particular trajectory group should have a high mean probability (maximum of 1) of being assigned to that group based on the maximum probability rule and a low mean probability (minimum 0) of being assigned to another group. A good fit would be reflected by probabilities of around .70/.80 or higher. To provide a more complete description of the groups, contingency analysis was conducted to establish associations between group membership and disability status, disability type, gender, parental income, and parental education.

The second research objective was to determine predictive relationships between college students' trajectories of stress and coping and graduation from college. To do so, we conducted a logistic regression analysis predicting graduation (or not) with two main blocks of predictors. In the first block, we entered five control variables: academic adjustment in the first term (i.e., prior to COVID-19), disability status (having a disability or not), gender, parental education, and parental income. In the second block, we introduced membership in the different stress and coping trajectory groups. Because the trajectory shapes are relatively similar across groups (see results below), we reduced the trajectory variable to two groups by comparing the higher risk group (i.e., high stress, low proactive coping or high defensive coping) with the two other groups. Thus, three dichotomous trajectory variables were entered in the second block. Finally, we reran the analysis while including the interaction scores between trajectory group membership and disability status to determine whether the associations with graduation would differ according to disability status.

Results

Stress and Coping Trajectories

Based on the BIC values and the probabilities of belonging to each group, the three-group models provided the best fit to the data for the three sets of scores (stress, proactive coping, and defensive coping). In the case of stress, the BIC for the three-group model was −5382.25 compared to −5669.94, −5408.96, and −5389.33 for the one-, two-, and five-group models, respectively. The four-group model presented a BIC similar to that for the three-group model (−5381.77), but with sample sizes lower than 5%, and was not retained. For proactive coping, the BIC for the three-group model was −3679.52 compared to −4023.02, −3738.08, −3871.71, and −3878.95, for the one-, two-, four-, and five-group models, respectively. For defensive coping, the BIC for the three-group model was −3862.70 compared to −4066.89, −3896.28, −4075.27, and −4080.86 for the one-, two-, four-, and five-group models, respectively. Table 1 presents the mean assignment probabilities for the three-group models retained using maximum probability assignment. The probability of belonging to a given group varied from .77 to .84, indicating that the trajectories generally aligned with individual response patterns.

Table 1 Mean Assignment Probabilities to Group Trajectories for Stress, Proactive Coping, and Defensive Coping (using maximum probability assignment) (n = 1,339 – 1,348)

	M	*Order*
Stress		
High (n = 410)	0.79	2
Moderate (n = 711)	0.77	2
Low (n = 218)	0.83	2
Proactive coping		
High (n = 260)	0.83	1
Moderate (n = 812)	0.82	1
Low (n = 276)	0.84	1
Defensive coping		
High (n = 75)	0.83	0
Moderate (n = 689)	0.79	2
Low (n = 579)	0.80	2

Note: The order indicates whether the trajectory was flat (0), linear (1), or quadratic (2)

Figures 1A, 1B, and 1C show the trajectory groups. Figure 1A shows the stress trajectories. Although the three groups presented different average stress levels (32% very stressed, 50% moderately stressed, 18% barely stressed), they revealed a similar pattern of change over time (quadratic effect for all three groups, see Table 1). Perceived stress increased from Time 2 to Time 3 and decreased thereafter to the lowest level in Time 4. Figure 1B depicts the proactive coping trajectories, with slightly different results. Although we again see three groups with relatively similar proportions to those for stress (20% very proactive, 24% barely proactive, 56% moderately proactive), all three groups showed linearly decreasing change, indicating a progressive reduction in proactive coping from Time 2 to 4. In Figure C, the significant quadratic effects indicate that most students (93%) followed an increasing trajectory for defensive coping, and notably after Time 3. Only 7% of students followed a high and stable defensive coping trajectory across all the waves.

Next, we conducted an initial series of contingency analyses to examine how disability status and type predict trajectory membership. Results revealed that higher proportions of students with than without disability belonged to three maladaptive groups: high stress (35.6% vs. 27.2%), X^2 (2) = 10.60, p < .001, low proactive (23.8% vs. 18.0%), X^2 (2) = 7.30, p < .05, and high defensive (8.7% vs. 3.7%), X^2 (2) = 17.03, p < .001. In contrast, students without disability were disproportionally more likely to be members of three opposite groups: low stress (17.1% vs. 14.3%), high proactive (20.8% vs. 17.5%), and low defensive (47.2% vs. 38.1%). An exploration of disability types showed that the high stress group contained more students with MHD (44.8%) and LD (35.3%) than with ADHD (24.8%) X^2 (4) = 19.56, p < .001, while the low stress group contained more students with ADHD (19.8%) than with MHD (13.7%) or LD (7.8%). Otherwise, disability type was not associated with either proactive or defensive coping trajectories.

We conducted a second analysis series to examine how the stress and coping trajectories were related to our other control variables (gender, parental education, parental income). Gender was associated with trajectories of stress, X^2 (2) = 55.71, p < .0001, and defensive coping, X^2 (2) = 55.81, p < .0001. Women were overrepresented in the high stress trajectory (34.1% vs. 16.5% for men) and underrepresented in the low stress trajectory (13.0% vs. 28.8% for men), whereas men were overrepresented in the high defensive coping trajectory (11.4% vs. 4% for women) and underrepresented in the low defensive coping trajectory (25.6% vs. 47.7% for women). It appears that men were generally less stressed than women across the pandemic waves, but that they made more use of defensive strategies to deal with their stress. Parental education was also associated with defensive coping strategies. More first-generation students were in the high defensive trajectory compared to other students (9.5% vs. 5.3%), with fewer first-generation students in the low defensive group (30.5% vs. 44.2%), X^2 (2) = 8.01, p < .018. Parental income was not associated with any particular trajectory.

Predictive Associations with College Graduation

Table 2 presents the logistic regression results for the prediction of graduation from college. Unsurprisingly, the control variables block (step 1) predicted the probability of graduation, X^2 (5) = 80.35, p < .001. Initial adjustment, *Exp(B)* = 1.628, gender, *Exp(B)* = 1.403, disability status, *Exp(B)* = .477, and to a lesser degree parental education, *Exp(B)* = 1.569, showed significant associations with graduation. The likelihood of graduating was stronger for stu-

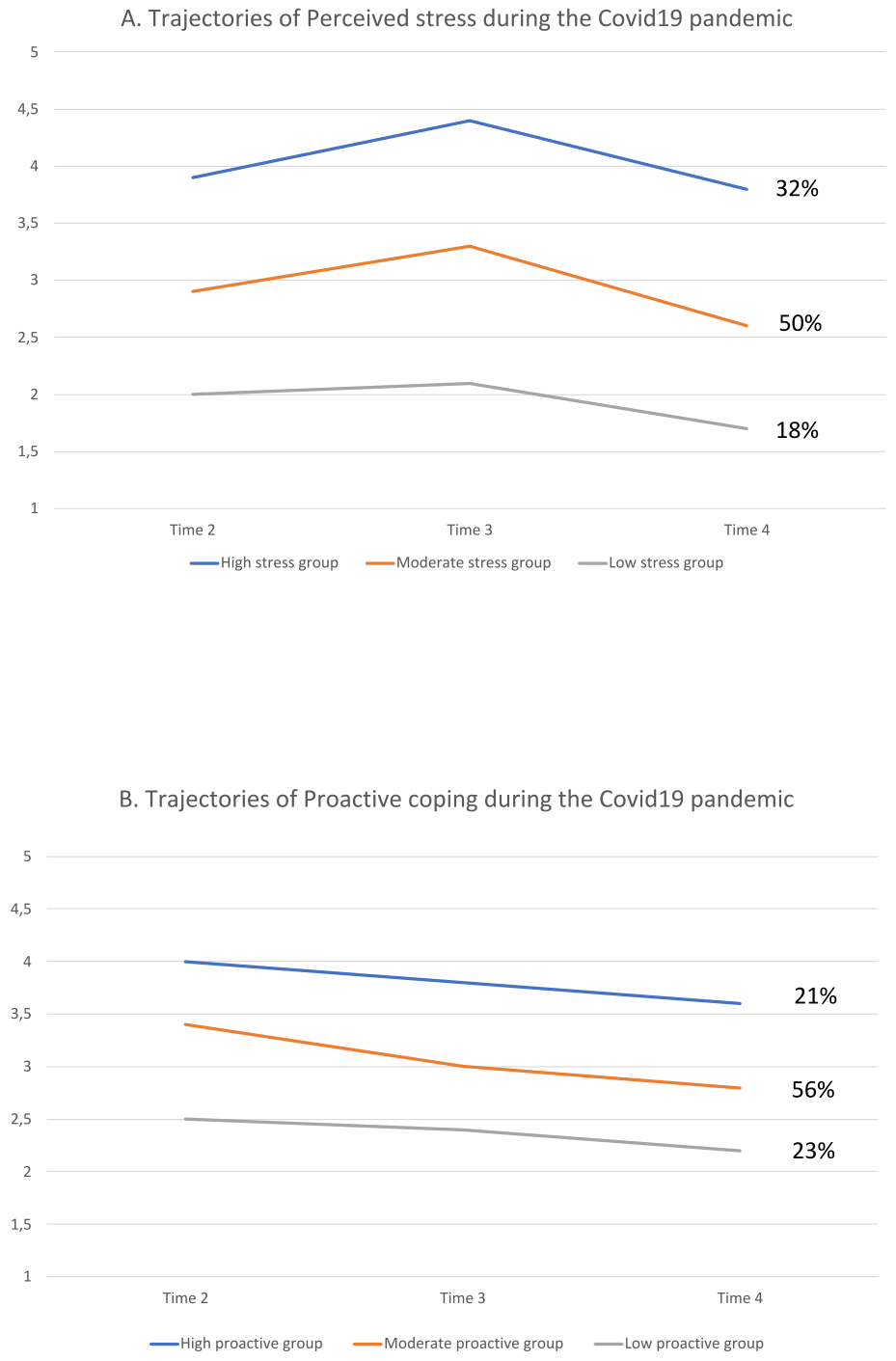

Fig. 1 Trajectories of stress and coping during COVID-19 pandemic (n = 1,339 to 1,348)

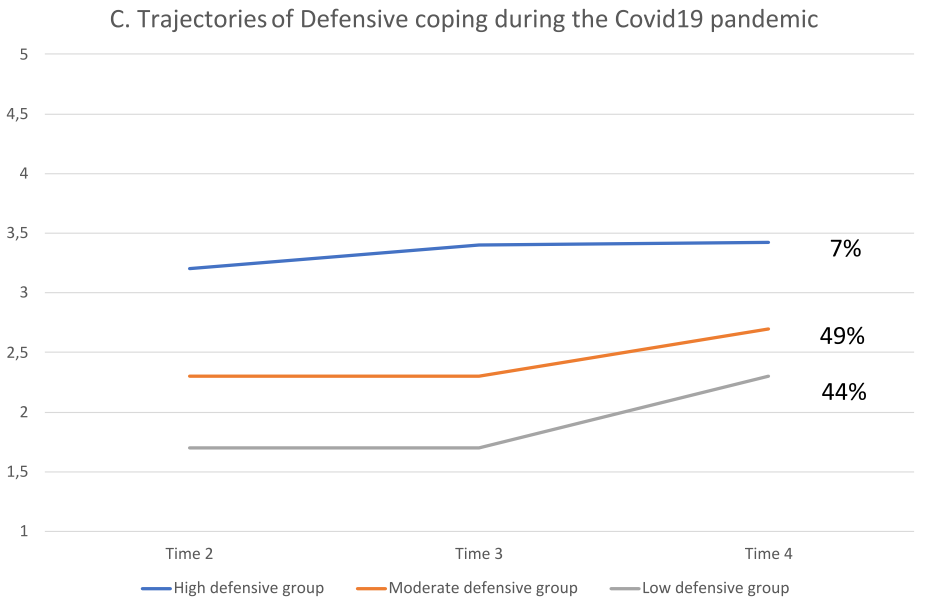

Figure 1 (continued)

Table 2 Logistic Regression Results Predicting Student College Graduation (0 = no, 1 = yes) based on Stress and Coping Trajectories during COVID-19 and Control Variables (n = 1,175)

Step	Predictor	B	SE(B)	Wald X^2	df	p-value	Exp(B)
1	Time 1 Adjustment	.487	.094	27.13	1	< .001	1.628
	Gender (0 = men)	.338	.159	4.51	1	.034	1.403
	Parent education (0 = no college)	.451	.240	3.52	1	.061	1.569
	Parent incomes	-.083	.064	1.68	1	.194	.920
	Disability status	-.739	.136	29.54	1	< .001	.477
2	Time 1 Adjustment	.490	.095	26.70	1	< .001	1.633
	Gender (0 = men)	.281	.165	2.90	1	.089	1.324
	Parent education (0 = no college)	.415	.242	2.95	1	.086	1.515
	Parent incomes	-.079	.065	1.48	1	.224	.924
	Disability status	-.740	.138	28.91	1	< .001	.477
	Stress	.028	.150	.036	1	.850	1.029
	Proactive coping	.313	.172	3.30	1	.069	1.367
	Defensive coping	-.744	.279	7.09	1	.008	.475

dents who were well adjusted in the first college term, for women, and for students without disability. In addition, first-generation students tended to be more at-risk of non-graduation than other students (trend).

Adding the trajectory variables (step 2) produced a significant change in prediction, $\Delta\chi^2$ (3) = 10.38, $p < .016$. As presented in Table 2, membership in a defensive coping trajectory was the main variable that contributes additional variance to this association over and above that for other factors. The more that students used defensive strategies across the waves, the lower their probability of graduating, *Exp(B)* = .475. To compare, the graduation rates were

77%, 70%, and 50% for the low defensive, moderate defensive, and high defensive groups, respectively. Membership in a proactive coping trajectory made a small contribution to predict graduation (a trend), while membership in stress trajectories was not predictive at all.

The last step was to explore whether the predictive associations between membership in stress and coping trajectories and college graduation would vary according to disability status. The inclusion of the interaction scores in a third step of the logistic regression (not shown in Table 2) did not add significant variance to the graduation rate, $\Delta\chi^2$ (3) = 1.31, p = .726. Thus, the associations between trajectory membership and college graduation were similar for students with and without disability.

Discussion

The first objective of this study was to examine trajectories of perceived stress and coping strategies among college students with and without disabilities throughout the COVID-19 pandemic in Quebec. Perceived stress increased from Time 2 to Time 3 before declining markedly by Time 4, reaching levels below those observed at the outset of the pandemic. Although three distinct stress trajectories were identified—including a high-stress group comprising nearly one-third of participants—the trajectories followed a broadly similar pattern over time. In contrast, coping trajectories revealed a gradual decline in proactive coping and a corresponding increase in defensive coping across the study period. Students with disabilities were disproportionately represented in the high-stress, high-defensive-coping, and low-proactive-coping trajectories, suggesting that they experienced greater and more persistent challenges in adapting to the evolving demands of the pandemic.

These findings are consistent with previous longitudinal research documenting elevated stress levels and deteriorating coping resources among students during the pandemic (Brown & Papp, 2024; Wang et al., 2024), particularly among students with disabilities (Dvorsky et al., 2022). The results suggest that as pandemic-related disruptions became prolonged and normalized, students increasingly disengaged from adaptive coping behaviors such as physical activity while relying more heavily on maladaptive strategies, including substance use. Such changes may have undermined their capacity to adapt effectively to ongoing stressors, thereby increasing vulnerability to adverse psychological and developmental outcomes. This pattern appears especially concerning for students with disabilities, who were more likely to report elevated stress and defensive coping while being less likely to engage in proactive coping. Collectively, these findings underscore the importance of implementing targeted support measures for this population during periods of prolonged societal disruption (Madaus et al., 2022).

An important finding concerns the apparent divergence between changes in stress levels and changes in coping behaviors over time. While perceived stress declined after Time 3, the use of proactive coping strategies continued to decrease and defensive coping strategies remained elevated. One possible explanation is that public health and institutional measures introduced after Wave 3—including expanded vaccination campaigns and the gradual return to in-person learning—may have reduced students' exposure to pandemic-related stressors and contributed to improvements in their well-being (Haase & Zander, 2026; Höhne et al., 2024). However, these measures may not have been sufficient to promote the development or maintenance of adaptive coping skills. Consequently, students may have experienced

lower levels of stress despite relying less on effective coping mechanisms. This interpretation aligns with Lazarus and Folkman's (1984) transactional model, which emphasizes coping as a central mechanism linking stress appraisals to subsequent adjustment. The findings therefore suggest that future emergency responses should not only aim to reduce environmental stressors but also actively foster students' coping resources.

The cross-analysis of stress and coping trajectories with the control variables yielded findings that are largely consistent with previous research. Women and students reporting mental health problems were overrepresented in the high-stress trajectories, whereas men were more likely to belong to trajectories characterized by elevated use of defensive coping strategies. These patterns align with evidence showing that women generally report higher levels of perceived stress when facing academic demands, although they also tend to engage more frequently in adaptive coping strategies, such as seeking emotional or instrumental support (Eisenbarth, 2019; Graves et al., 2021). By contrast, men are often less likely to seek support and may rely more heavily on avoidant or disengagement-oriented coping responses when confronted with stressful situations (Livingston et al., 2022).

Similarly, students with mental health problems are known to experience higher levels of stress, anxiety, and depressive symptoms throughout their postsecondary studies than their peers without such conditions (Zorach & Lipka, 2022). They are also more likely to adopt avoidance-based coping strategies when confronted with academic and personal stressors (Le Vigoureux et al., 2025). Taken together, these findings suggest that both students with mental health problems and male students may face heightened challenges in adapting to large-scale disruptions such as a pandemic. Consequently, preventive interventions designed to strengthen adaptive coping skills and facilitate access to support resources may be particularly beneficial for these groups.

Another noteworthy finding concerns first-generation students, who were more likely to follow trajectories characterized by greater use of defensive coping strategies. This pattern may reflect the greater difficulties experienced by first-generation students during the COVID-19 pandemic, including greater challenges with distance learning and limited access to social and institutional support (Fruehwirth et al., 2021). The abrupt shift to remote learning may have exacerbated pre-existing educational inequalities by reducing opportunities for academic support, peer interaction, and social integration. From the perspective of stress appraisal theory, first-generation students may have perceived themselves as having fewer resources available to meet these demands, thereby increasing the likelihood of relying on defensive coping responses such as avoidance or withdrawal (Amirkhan et al., 2023). These findings further highlight the importance of ensuring equitable access to support services during periods of educational disruption.

Our second objective was to determine whether trajectories of perceived stress and coping strategies predicted college graduation beyond pre-pandemic academic adjustment and other personal characteristics, and whether these associations differed according to disability status. A key finding, consistent with Lazarus and Folkman's (1984) transactional model of stress, is that coping trajectories appeared to be more strongly associated with graduation than trajectories of perceived stress. In other words, how students responded to pandemic-related challenges was more strongly associated with their educational outcomes than the level of stress they experienced.

In particular, sustained reliance on defensive coping strategies was associated with substantially lower odds of graduation. These strategies included behaviors such as excessive alcohol

or drug use, excessive videogaming, and denial of the potential physical and psychological consequences of the pandemic. Consistent with previous research (Le Vigouroux et al., 2025; Wang et al., 2024), such coping responses may interfere with students' cognitive engagement, self-regulation, and academic involvement, thereby undermining their ability to persist in their studies. Although the mechanisms underlying this association could not be directly examined in the present study, avoidant or negative coping may have contributed to a gradual disengagement from academic activities, which has been associated with greater burnout and dropout intentions among university students (Salmela-Aro et al., 2021). Given that students with disabilities were overrepresented in the defensive coping trajectories, these findings suggest a potential pathway through which disability status may be linked to lower graduation rates. Nevertheless, longitudinal intervention studies would be required to establish the causal role of defensive coping in shaping academic outcomes among students with disabilities.

The use of proactive coping strategies throughout the pandemic also emerged as a positive predictor of graduation, although the association reached only trend-level significance ($p < .07$). Importantly, this effect remained observable after accounting for several established predictors of academic success, including students' initial adjustment to college. Proactive strategies included maintaining physical activity and spending quality time with family. These behaviors may have supported students' psychological well-being and social connectedness, while family and social support have been associated with greater engagement in online learning and academic persistence during the COVID-19 pandemic (Li et al., 2022; Zhai & Carney, 2024). However, students with disabilities were less likely to belong to trajectories characterized by sustained use of proactive coping strategies, potentially placing them at greater risk of academic difficulties and non-graduation. Taken together, these findings underscore the importance of interventions aimed at fostering adaptive coping resources among students with disabilities, particularly during periods of prolonged uncertainty and disruption.

The results obtained for the control variables further corroborate a substantial body of research on predictors of postsecondary graduation (see Kocsis & Molnár, 2024). Students who reported poorer academic adjustment during their first college term, men, students with disabilities, and first-generation students were all at increased risk of non-graduation. Notably, the predictive effects of coping trajectories remained evident even after accounting for these well-established risk factors. This finding highlights the unique contribution of coping processes to academic persistence and suggests that interventions targeting coping skills may complement existing efforts to support student success. Whether during a pandemic or under more typical educational conditions, these populations should remain priority targets for preventive and support initiatives.

Strengths and Limitations

This study has several notable strengths. First, it relied on a large longitudinal sample of college students followed across multiple phases of the COVID-19 pandemic. Second, the availability of pre-pandemic data made it possible to account for students' initial academic adjustment when examining subsequent graduation outcomes. Third, the longitudinal design allowed for the identification of distinct trajectories of stress and coping rather than relying on cross-sectional snapshots. Finally, graduation was assessed using institutional records rather than self-reports, thereby reducing the risk of reporting bias for this key outcome.

These strengths should nevertheless be considered alongside several limitations. First, with the exception of graduation status, all measures were based on student self-reports. As a result, shared-method variance and reporting biases may have influenced the observed associations. Future research would benefit from incorporating multiple sources of information, including physiological indicators of stress and external assessments of coping behaviors. Such measures could provide a more comprehensive understanding of students' responses to prolonged stressors and help determine whether perceived and physiological stress follow similar developmental trajectories.

Second, disability status was based primarily on students' self-reported diagnoses. Although participants were asked to report only diagnoses established by qualified health professionals, and this information was subsequently reviewed by disability counsellors at participating colleges, the study did not have access to complete medical records or standardized diagnostic documentation. Consequently, some degree of diagnostic misclassification cannot be ruled out. This limitation is particularly relevant given the heterogeneity of disability categories and the possibility that some students may have inaccurately reported their diagnostic status.

Third, graduation data were obtained from the participating colleges four years after students' initial enrollment. Although it is theoretically possible that some students classified as non-graduates completed their studies at another institution, this scenario appears unlikely. Participants remained enrolled at the same college during the three pandemic assessment waves, suggesting limited mobility across institutions during the study period. Nevertheless, the possibility of a small number of unobserved transfers cannot be entirely excluded.

Fourth, caution is warranted when generalizing the findings. The sample included a larger proportion of women than is typically observed in the Québec college population and was drawn exclusively from colleges located in Québec. As a result, the extent to which these findings apply to students in other educational systems, cultural contexts, or geographic regions remains uncertain. Replication in more diverse and representative samples would strengthen confidence in the generalizability of the observed patterns.

Finally, our modelling was based on three measurement points, and the estimation of non-linear trajectories is often considered less stable in such a context. Although public health and institutional responses (e.g., within colleges) to the pandemic clearly evolved in a non-linear manner over time, with alternating periods of tightening and relaxation across successive waves, this methodological limitation cannot be overlooked. Future studies including at least four measurement occasions will be needed to further validate the non-linear trajectories reported in this article.

Implications for Interventions

The present findings highlight the importance of strengthening institutional and public health responses aimed at supporting students with disabilities during periods of large-scale disruption such as pandemics. Because students with disabilities were disproportionately represented in trajectories characterized by elevated stress, greater reliance on defensive coping strategies, and lower use of proactive coping strategies, interventions should focus not only on reducing stress exposure but also on strengthening adaptive coping resources. More broadly, the results suggest that coping processes constitute a modifiable target for intervention that may contribute to both student well-being and academic persistence.

During the COVID-19 pandemic, considerable effort was devoted to informing students about public health risks and preventive measures (Mahmood et al., 2022). Although such information was essential, comparatively less attention was given to helping students develop the coping skills required to manage prolonged uncertainty, social isolation, and educational disruption. Future public health responses should therefore integrate evidence-based coping education into crisis communication strategies. Alongside recommendations concerning hygiene and safety, students should receive guidance on adaptive coping practices, including stress identification, emotional regulation, cognitive restructuring, mindfulness, help-seeking, and the maintenance of healthy daily routines. At the same time, awareness campaigns could address defensive coping responses—such as avoidance, denial, social withdrawal, and compulsive behaviors—that may undermine psychological adjustment and academic functioning over time.

The findings also underscore the importance of maintaining supportive and predictable learning environments during periods of disruption. Public health agencies and college student services should collaborate to ensure that students, particularly those with disabilities, remain socially connected and have access to accessible support resources. Digital environments can play an important role in this regard when they are intentionally designed to promote both social engagement and coping skill development. For example, institutions could offer online mindfulness programs, peer-support groups, and virtual mentoring initiatives to help students manage stress and maintain supportive social connections during periods of educational disruption. Empirical studies have shown that online mindfulness and peer-support interventions can reduce psychological distress and improve well-being among university students, including during the COVID-19 pandemic (Grégoire et al., 2024; Simonsson et al., 2021). Such initiatives, combined with regular communication providing practical guidance, encouragement, and opportunities for social interaction, may help students maintain a sense of connection and control and adapt more effectively to disrupted learning environments.

At the institutional level, college professionals—including psychologists, academic and career counsellors, and disability service providers—should be trained to identify early signs of maladaptive coping and to intervene proactively. Particular attention should be paid to behaviors such as avoidance, procrastination, denial, minimization of difficulties, and compulsive engagement in distracting activities, which may signal increased risk for academic disengagement (Salmela-Aro et al., 2021). Screening and support initiatives targeting these behaviors could help prevent more serious academic and psychological difficulties from developing.

Faculty members can also play a meaningful role in fostering adaptive coping and resilience. Beyond providing academic accommodations when necessary, instructors can contribute to supportive learning environments by encouraging metacognitive reflection, promoting realistic appraisals of stressful situations, offering constructive feedback focused on learning and mastery, and demonstrating empathy toward students experiencing difficulties. In disciplines such as psychology, education, and the social sciences, explicit instruction regarding coping processes and stress management may further enhance students' capacity to navigate future challenges. More generally, increasing awareness among faculty of the links between coping, well-being, and academic success may facilitate earlier identification of vulnerable students and more effective referral to support services. Emerging evidence from institutional initiatives incorporating these principles suggests that such approaches hold promise for improving both student adjustment and educational outcomes (Wang et al., 2026).

Conclusion

This longitudinal study provides evidence that college students' coping resources deteriorated over the course of the COVID-19 pandemic, with decreasing use of proactive coping strategies and increasing reliance on defensive coping strategies across successive pandemic waves. These patterns were particularly pronounced among students with disabilities, who were disproportionately represented in trajectories characterized by elevated stress, greater use of defensive coping, and lower use of proactive coping. Importantly, coping trajectories emerged as stronger predictors of college graduation than stress trajectories, suggesting that students' responses to adversity may be more consequential for long-term academic outcomes than the stress they experience per se.

Taken together, these findings support theoretical models that emphasize the central role of coping in the adaptation process and highlight coping as a critical target for intervention. Future public health and educational responses to large-scale disruptions should extend beyond efforts to reduce stress exposure and include initiatives aimed at strengthening adaptive coping skills, discouraging maladaptive coping behaviors, and maintaining supportive learning and social environments. Such efforts may be particularly important for students with disabilities, who appear to face heightened risks for both psychological and academic difficulties during periods of prolonged uncertainty.

Data Availability Data from this study is available upon request to the first author of the present paper.

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2. All participants agree to participate on a voluntary basis.
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5. The authors declare no conflict of interest.

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