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ARTICLE

Undergraduate students' motivational profiles before and during the COVID-19 pandemic: The role of educational climate and trait self-control

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Abstract

Background: Universities faced important and sudden changes following the lockdown measures imposed during the COVID-19 pandemic. Traditional educational practices were disrupted as campuses were closed while distance learning was hastily adopted.

Aims: This study documents the evolution of university students' autonomous and controlled motivation for their studies following campus closures by relying on a person-centred perspective. More specifically, it examines motivation profiles and their temporal stability across two time points taken before and during the pandemic, while also considering the role of educational climate, trait self-control and control variables (sex and age) as predictors of profile membership.

Sample: A total of 1940 university students participated in this study by responding to online questionnaires at two time points, before (Time 1) and after (Time 2) the pandemic.

Methods: We relied on latent profile and latent transition analyses to estimate motivation profiles, their temporal stability and their predictors.

Results: A four-profile solution (*Self-Determined, Moderately Motivated*, *Extrinsically Motivated*, *Amotivated*) was selected and replicated at both time points. We observed a low degree of variability in profile membership over time, especially for the *Amotivated* profile. A need-supportive educational climate and trait self-control consistently predicted a greater

likelihood of membership into more adaptative profiles (*Self-Determined, Moderately Motivated*).
Conclusions: The COVID-19 pandemic did not drastically change the motivational profiles of university students. Nevertheless, educational climate and self-control appeared to 'protect' students against the endorsement of more problematic motivation profiles both before and during the pandemic, making them important targets for intervention.

KEYWORDS
academic motivation, COVID-19, educational climate, latent transition analysis, self-control, University Students

BACKGROUND

Early 2020 was marked by unprecedented shifts in university functioning caused by the onset of the COVID-19 pandemic. To limit the spread of COVID-19, campuses were closed, and distance learning was abruptly implemented in most universities (Marinoni et al., 2020). Campus closures lasted throughout 2020 in many countries, resulting in a forced prolonged exposure to suboptimal teaching and learning conditions, which contributed to increased levels of distress among many students (Pokhrel & Chhetri, 2021). Many researchers raised concerns about the consequences of the pandemic for students' academic outcomes, including their motivation. Rapidly disseminated findings suggested negative developmental trends in students' motivation after the onset of the pandemic (Janke et al., 2022; Usher et al., 2022). However, other studies contradicted this trend, observing no significant decrease in university students' motivation (Bolatov et al., 2022; Pasion et al., 2020).

This heterogeneity in results calls for additional research on whether and how students' motivation changed as a result of the COVID-19 pandemic. The present study provides new insights on this important topic through the adoption of a person-centred perspective focused on the nature and one-year stability of students' motivation profiles before and during the COVID-19 pandemic. The role of contextual (educational climate) and individual (trait self-control, sex, age) factors as predictors of students' likelihood of profile membership is also examined.

Academic motivation

According to Self-Determination Theory (SDT; Ryan & Deci, 2017), academic motivation is a multidimensional construct encompassing different types of behavioural regulation organized along a continuum of self-determination. At one end of this continuum is intrinsic motivation, which occurs when students enjoy their educational tasks. This is considered to reflect the most autonomous, or self-determined, form of motivation. Then, identified regulation occurs when students feel that their education is important and coherent with their personal values and goals. Next on the continuum, introjected regulation occurs when students feel internally pressured to engage in their studies to preserve their positive self-image or to avoid feelings of shame or guilt. External regulation then occurs when students feel externally pressured to engage in their studies to attain rewards or to avoid punishments. Lastly, amotivation is a state that describes a complete lack of reason to engage in academic work (non-regulation). More globally, intrinsic motivation and identified regulation can be classified as autonomous types of motivation, whereas external and introjected regulations can be considered as controlled types of motivation. Numerous studies have supported the presence of well-differentiated associations between these various types of behavioural regulation and important educational outcomes. For instance,

autonomous forms of motivation have been positively linked to students' engagement, persistence and achievement while controlled forms of motivation and amotivation have been found to be associated with school dropout, academic dishonesty and anxiety (Guay et al., 2008; Howard et al., 2021). These results thus highlight the important role played by academic motivation in general, in addition to highlighting the importance of finding ways to support autonomous motivation while limiting controlled motivations and amotivation as students undergo important changes in their academic trajectories, such as those imposed by the COVID-19 pandemic.

A person-centred perspective on academic motivation

Previous studies of academic motivation conducted during the COVID-19 pandemic have mostly relied on variable-centred approaches to assess general changes in students' levels of motivation during the pandemic, assuming that their results would generalize to the whole student population. Despite their relevance, these studies fail to acknowledge that students' motivational experiences tend to be rooted in a dynamic combination of diverse types of behavioural regulation (Litalien et al., 2019; Vallerand et al., 1997). By ignoring the presence of subpopulations of students displaying qualitatively distinct configurations of behavioural regulations, these studies did not grasp the full heterogeneous reality of students' academic motivation. Adopting a person-centred perspective is necessary to capture this heterogeneity. Indeed, person-centred analyses are designed to uncover the various ways in which various types of behavioural regulations are combined within different subpopulations (or profiles) of students (Litalien et al., 2019).

In this study, we rely on a person-centred approach to identify the various types of motivation profiles among students exposed to the COVID-19 pandemic, as well as the stability of these profiles before and during the pandemic. In doing so, we adopt a recently advocated bifactor operationalization of academic motivation (Howard et al., 2018, 2020; Litalien et al., 2017; See Figure 1) allowing us to jointly obtain an estimate of students' global level of self-determined motivation (an estimate anchored in their ratings of all types of behavioural regulation) together with a non-redundant estimate of the

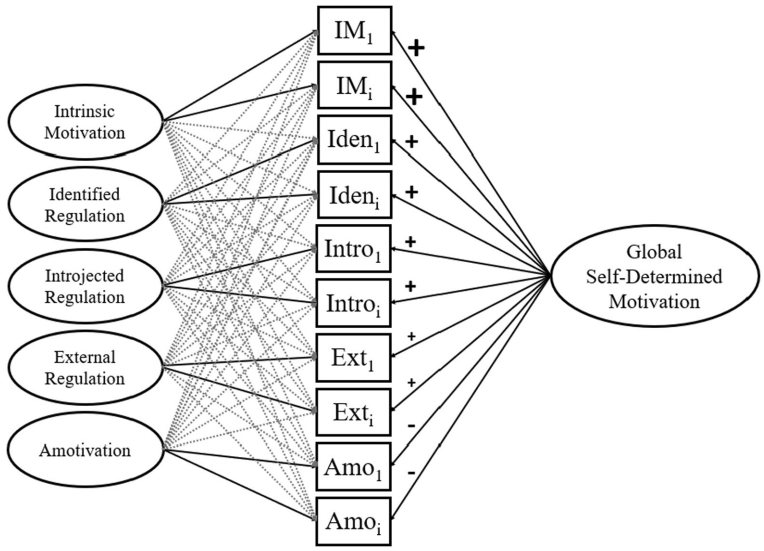

FIGURE 1 Bifactor representation of the specific and global dimensions of academic motivation. *Note*: Ovals represent latent factors while rectangles represent items. The + and − signs represent the direction of the loadings of the items on the global self-determined motivation factor while the size of these signs represent the strength of these loadings. IM = Intrinsic motivation; Iden = Identified regulation; Intro = Introjected regulation; Ext = Extrinsic regulation; Amo = Amotivation. i = Items 2–4.

extent to which each type of behavioural regulation deviates from, or is aligned with, this global level. Indeed, statistical research has demonstrated that it was necessary to account for this global/specific duality, when present, to properly identify meaningful latent profile solutions (Morin et al., 2017; Morin, Boudrias, et al., 2016).

Predictors of academic motivation

SDT assumes that the social environment in which students evolve helps shape the nature of their academic motivation (Ryan & Deci, 2017). More precisely, SDT suggests that educational contexts helping to support the satisfaction of students' psychological needs for autonomy (a sense of volition), competence (a sense of effectiveness and mastery) and relatedness (a sense of connection with meaningful others) should help foster more autonomous forms of motivation, whereas a context that thwarts these needs should foster more controlled forms of motivation and amotivation (Ryan & Deci, 2020). These propositions have been supported by recent meta-analyses, which have also helped to position students' psychological need satisfaction as the most proximal driver of autonomous types of motivation (Bureau et al., 2022; Vasconcellos et al., 2020).

Unfortunately, the lockdown measures imposed by the COVID-19 pandemic are likely to have interfered with students' need satisfaction. Indeed, prolonged campus closures imposed external restrictions on students who were forced to take all their courses online, thus interfering with the fulfilment of their need for autonomy (Janke et al., 2022). Likewise, the sudden switch to distance learning disrupted learning processes, as many instructors were not prepared to move their classes online (Carrillo & Flores, 2020), just like many students did not have access to an optimal home setting for distance learning (Falardeau et al., 2022). This suboptimal learning environment is thus likely to have interfered with the fulfilment of students' need for competence. Lastly, campus closures and distance learning both resulted in diminished possibilities for social interactions between students, their peers and their instructors, thus directly interfering with the fulfilment of students' need for relatedness (Janke et al., 2022).

Gilbert et al. (2021; 2022) identified a variety of need-supporting and need-thwarting components (collectively referred to as need nurturing; Tóth-Király et al., 2020) of universities' educational climate that could help students maintain adequate levels of autonomous motivation while limiting controlled motivation and amotivation, even within otherwise unfavourable learning conditions such as those imposed by the COVID-19 pandemic. Examples of these components include the provision of relevant course options, clear and accessible information on the curriculum, and networking opportunities among students and between students and instructors (Gilbert et al., 2021). Importantly, Gilbert et al. (2022) showed that programs, which provided students with such need-nurturing conditions during the first wave of the COVID-19 pandemic were more efficient in helping students maintain satisfactory levels of need satisfaction. Conversely, failing to do so seemed to interfere with need satisfaction (Gilbert et al., 2022). These results thus suggest, albeit indirectly, that the need-supportive and need-thwarting components of universities' educational climate have potentially played an important role in minimizing or amplifying the impact of campus closure on students' self-determined motivational profiles.

Some stable personality characteristics could also have helped students maintain adequate motivation profiles during the COVID-19 pandemic by influencing their natural tendencies to adopt more or less self-determined forms of motivation (Gillet et al., 2017; Komarraju et al., 2009). For instance, trait self-control (i.e., the ability to exert control over one's thoughts, feelings and behaviours to prioritize long-term goals over instant gratification; Baumeister & Heatherton, 1996) has recently been identified as a strong determinant of motivation quality, being linked to increased levels of autonomous motivation and decreased levels of controlled motivation over time (Converse et al., 2019; Holding et al., 2019). Trait self-control may have been particularly important during the COVID-19 pandemic since distance learning requires students to be actively involved in their learning process (e.g., managing their learning schedule, avoiding procrastination; Eberle & Hobrecht, 2021). Moreover, self-control is a proactive

capacity believed to help students assess and understand their needs, values and interests, thus facilitating the endorsement of autonomous forms of motivation (Holding et al., 2019), even despite unfavourable learning conditions (e.g., forced distance learning).

The present study

The first goal of this study was to investigate the nature and temporal stability of university students' academic motivation profiles before and during the COVID-19 pandemic while relying on a proper disaggregation of their global and specific levels of motivation. Results from previous person-centred research (Litalien et al., 2019; Tóth-Király et al., 2022) suggest that a relatively small (3 to 5) number of motivation profiles should be identified (Hypothesis 1). Based on the negative impact of the pandemic on students' motivation and psychological need satisfaction reported in some previous studies (Falardeau et al., 2022; Janke et al., 2022; Usher et al., 2022), we also postulated that membership into profiles characterized by high levels of self-determined motivation would be less stable over time than membership into less desirable motivation profiles (Hypothesis 2). Second, this study aimed to investigate the role of the need-nurturing characteristics of the program educational climate and students' trait self-control in the prediction of profile membership, while controlling for sex and age. These two demographic characteristics have been previously shown to relate to motivation, with female and older university students generally having a more self-determined motivational orientation than male and younger university students (Brouse et al., 2010; Gillet et al., 2017; Stynen et al., 2014; Vallerand et al., 1989, 1992). As our sample (see next section) includes a majority of women and slightly older students than we expected, we considered it important to consider these controls in our analyses. Based on the aforementioned theoretical and empirical considerations (Gilbert et al., 2021, 2022; Holding et al., 2019), we postulated that need-nurturing study programs and high trait self-control would predict membership into profiles characterized by higher levels of autonomous motivation at both time points, while also possibly predicting transitions to profiles characterized by higher levels of autonomous motivation across time points, beyond the role played by sex and age (Hypothesis 3). From a practical perspective, this study was thus designed to help identify whether and how the COVID-19 pandemic might have interfered with students' motivation, and whether characteristics of the educational climate and students' trait self-control might have helped limit these effects.

METHOD

Procedure and participants

During the 2019 Fall semester (before the COVID-19 pandemic), we contacted the entire population ($N = 12{,}153$) of first-year undergraduate students registered in disciplinary baccalaureates (i.e., programs focusing on a specific field of study) from two large French-speaking Canadian universities. Of these students, 1425 (participation rate: 11.73%; Female = 80.1%, $M_{age} = 21.56$; $SD_{age} = 4.99$) agreed to participate by completing an online questionnaire. During the 2020 Fall semester (during the COVID-19 lockdown), all potential participants ($N = 12{,}153$) were re-invited to complete a follow-up questionnaire. A total of 882 students agreed to do so (participation rate: 7.26%; Female = 79.2%, $M_{age} = 22.61$; $SD_{age} = 4.86$). At each measurement occasion, student participation was voluntary, and an incentive was offered to encourage participation (i.e., a chance to win one of five $50 gift cards). Participation was also completely anonymous, meaning that only general invitations were sent to all students at T2, including those who initially completed the T1 questionnaire (data from students who responded to both time points were merged using a unique identifier generated by the respondents). As a drawback, fewer students participated in both measurement occasions ($n = 367$).

Measures

Academic motivation

Students' academic motivation was measured using the original French version of the Academic Motivation Scale (AMS; Vallerand et al., 1992). Following a stem asking 'Why do you go to university?', this scale measures intrinsic motivation (only the subscale of intrinsic motivation to know was used in this study; e.g., *Because I experience pleasure and satisfaction while learning new things*), identified regulation (e.g., *Because I think that a high-school education will help me better prepare for the career I have chosen*), introjected regulation (e.g., *To prove to myself that I am capable of completing my university degree*), external regulation (e.g., *In order to obtain a more prestigious job later on*) and amotivation (e.g., *I once had good reasons for going to school; however, now I wonder whether I should continue*). Each subscale includes four items answered on a 7-point scale (1 = *completely false* to 7 = *completely true*). Cronbach's alphas[1] were adequate, ranging from .72 to .92 at Time 1 (T1; M_{α} = .84) and .73 to .95 at Time 2 (T2; M_{α} = .87).

Educational climate

Participants' perceptions of the educational climate of their program were assessed using the original French version of the College Need Support/Thwarting Questionnaire (CNSTQ; Gilbert et al., 2021). Following a stem stating 'In my study program…', this instrument measures autonomy support (e.g., *A variety of options (courses, teachers, length of study) is available to students*), competence support (e.g., *Information about the program is easily and quickly accessible*), relatedness support (e.g., *There are events that allow students to get to know their teachers better*), autonomy thwarting (e.g., *Students cannot make choices to influence the content of their studies*), competence thwarting (e.g., *Administrative officials do not communicate to students the important decisions that affect their progress*) and relatedness thwarting (e.g., *The workload is so intense that students' social relationships suffer*). Each subscale includes four items answered on a 7-point scale (1 = *completely false* to 7 = *completely true*). Cronbach's alphas were adequate, ranging from .73 to .91 at T1 (M_{α} = .80) and .75 to .90 at T2 (M_{α} = .81). In this study, we rely on a single global indicator of exposure to a need-nurturing educational climate estimated from all items (α_{T1} = .81; α_{T2} = .92).

Trait self-control

Trait self-control was measured using the French version (Brevers et al., 2017) of the Brief Self-control Scale (BSCS; Tangney et al., 2004). With 13 items, this scale assesses participants' capacity to resist short-term gratification and achieve long-term goals (e.g., *I am able to work effectively toward long-term goals*) using a 5-point scale (1 = *not at all* to 5 = *very much*). Cronbach's alpha for this scale was .84 (T1) and .85 (T2).

ANALYSES

Preliminary analyses

Preliminary factor analyses were conducted using Mplus 8.8 (Muthén & Muthén, 2017) to evaluate the psychometric properties and longitudinal invariance of all measures. Factor scores estimated in standardized units (M = 0, SD = 1) were saved from these preliminary models and used in the main analyses (for a discussion on the advantages of factor scores, see Morin, Boudrias, et al., 2016).

[1]We also report more precise coefficients of composite reliability (omega: McDonald, 1970) as part of our preliminary measurement analyses (Section 1 of the Supporting Information).

Details on these models and their longitudinal invariance are reported in the Supporting Information (see Section 1). Correlations between all variables included in this study are presented in Table 1. Finally, results from a MANOVA revealed no significant differences between participants who completed both time points versus those who only participated at Time 1 on all variables included at T1 (main effect; $F[10, 1332] = 1.451$, $p = .153$; Wilk's $\Lambda = .989$).

Latent profile and transition analyses

Latent profile analyses (LPA) and latent transition analyses (LTA) were estimated in Mplus 8.8 with the robust maximum likelihood (MLR) estimator (Muthén & Muthén, 2017) and full information maximum likelihood (FIML) to handle missing data. FIML allowed us to include all participants ($N = 1940$) who completed at least one wave of data (Enders, 2010; Graham, 2009). We first estimated LPA models including 1–8 profiles separately at T1 and T2 using the six motivation factors obtained as part of our preliminary analyses (global self-determined motivation, intrinsic motivation, identified regulation, introjected regulation, external regulation and amotivation). The global self-determined motivation factor was defined based on all motivational items, with loadings corresponding to the position of these items on the theoretical continuum of motivation proposed by SDT (high and positive for intrinsic, moderately high and positive for identified regulation, moderately low and positive for introjected regulation, low and positive for external regulation and moderately high and negative for amotivation), which thus reflect the extent to which student motivation can be considered to be self-determined (Howard et al., 2020). The mean and variance of all six motivation indicators were allowed to vary over time (Morin & Litalien, 2019). To ensure convergence on a true maximum likelihood, these analyses relied on 5000 random start values each allowed 1000 iterations and 200 final optimizations (Hipp & Bauer, 2006). These values were increased to 10,000, 1000 and 500 for the longitudinal analyses (Morin & Litalien, 2019).

After selecting the optimal LPA solution at both time points, and assuming the same number of profiles over time, these solutions were combined into a longitudinal LPA to assess their longitudinal similarity in the following sequence (Morin, Meyer, et al., 2016): (1) configural similarity (same number of profiles); (2) structural similarity (same within-profile means); (3) dispersion similarity (same within-profile variances) and (4) distributional similarity (same profile size). Similarity is confirmed when lower values are observed on at least two information criteria out of the Bayesian Information Criterion (BIC), Sample-Size-Adjusted BIC (ABIC) and Constant Akaike Information Criterion (CAIC) from one step to the next (Morin, Meyer, et al., 2016). The most similar model was then converted into our final LTA to investigate within-person stability and transitions using the manual 3-step approach advocated by Morin and Litalien (2017, 2019) for this conversion.

Predictors of profile membership

Predictors were directly included into the final LTA via a multinomial logistic regression link, allowing us to assess their associations with participants' likelihood of profile membership at T1 and T2. Three models of prediction were tested and contrasted using the same aforementioned information criteria. First, the associations between predictors and profile membership were freely estimated at both time points, and the predictions of profile membership at T2 were free to vary across T1 profiles to assess the links between predictors and specific profile-to-profile transitions. Second, the associations between predictors and profile membership were free to vary across time points but not as a function of Time 1 profiles. Third, the associations between predictors and profile membership were set to be equal over time (predictive similarity).

TABLE 1 Correlations between study variables.

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Sex																		
2. Age	.025																	
3. T1 global self-determined motivation	−.015	−.010																
4. T1-specific intrinsic motivation	.109**	.102**	.260**															
5. T1-specific identified regulation	−.049	.002	.064*	−.102**														
6. T1-specific introjected regulation	−.013	−.048	.040	−.078**	−.046													
7. T1-specific external regulation	.017	−.102**	.028	−.061*	.025	.077**												
8. T1-specific amotivation	.044	−.089**	−.055*	.061*	−.054*	.039	.023											
9. T1 need-nurturing program climate	.018	−.038	.374**	.202**	.056*	−.099**	−.110**	−.298**										
10. T1 trait self-control	−.098**	.102**	.185**	.120**	−.062*	−.143**	−.114**	−.215**	.263**									
11. T2 Global self-determined motivation	−.093	.065	.814**	.078	−.153**	−.023	−.154**	−.037	.262**	.280**								
12. T2-specific intrinsic motivation	.098	.113*	.240**	.615**	−.374**	.042	.092	−.016	.135**	.160**	.287**							
13. T2-specific identified regulation	−.113*	−.066	−.016	−.109*	.305**	−.027	−.002	.179**	−.001	.041	.125**	−.073*						

TABLE 1 (Continued)

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
14. T2-specific introjected regulation	.068	.052	.042	−.044	−.225**	.713**	.123*	.064	−.152**	−.044	.066*	−.003	−.034					
15. T2-specific external regulation	−.029	−.112*	.007	.015	−.200**	.139**	.816**	−.058	−.136**	−.067	.046	−.068*	.083*	.052				
16. T2-specific amotivation	.102	−.053	−.098	.155**	−.111*	.005	−.017	.691**	−.283**	−.297**	−.100**	.045	−.031	.010	.015			
17. T2 need-nurturing program climate	−.002	−.032	.347**	.169**	.070**	−.136**	−.119**	−.277**	.843**	.290**	.314**	.136**	.040	−.164**	−.148**	−.330**		
18. T2 trait self-control	−.113*	.117*	.241**	.061	.012	−.101	−.088	−.124*	.170**	.713**	.199**	.185**	.026	−.127**	−.089*	−.236**	.221**	
Mean	–	21.56	31.37	5.68	5.78	3.76	4.25	1.76	4.83	3.29	31.71	5.75	5.82	3.85	4.27	1.82	4.69	3.19
SD	–	4.99	6.49	1.21	1.05	1.75	1.61	1.17	1.00	.67	6.68	1.20	1.06	1.80	1.55	1.20	1.05	.70

Note: All variables used in our main analyses are factor scores estimated in standardized units with a $M = 0$ and a $SD = 1$. The means and *SD*s in this table were computed from the items and are only provided for descriptive purposes. For the indicator of global self-determined motivation, a weighted composite score was computed using a sum of the products of item score and item loading. T1 = Time; T2 = Time 2. $^{*}p < .05$. $^{**}p < .01$.

RESULTS

Latent profile solution

Matching our first hypothesis, our results converged on the selection of a 4-profile solution at T1 and T2. The procedure and results leading to this section are reported in Section 2 of the Supporting Information. The results from the test of longitudinal similarity conducted on this solution are reported in the top section of Table 2 and revealed that each step resulted in a lower value on at least two of the information criteria, thus supporting the complete distributional similarity of this solution over time. The model of distributional similarity, retained for interpretation, is illustrated in Figure 2 (within-profile means are presented in Table S3).

Profile 1 (*Self-Determined*) was the smallest (17.42%) and described students with very high levels of global levels of self-determined motivation, high levels of intrinsic motivation and moderately high levels of identified regulation. This profile also displayed average levels of introjected and external regulations coupled with low levels of amotivation. Profile 2 (*Moderately Motivated*) corresponded to 23.54% of the sample presenting moderately high levels of global self-determined motivation, moderate levels of intrinsic and identified regulations, moderately low levels of introjected and external regulations, and average levels of amotivation. Profile 3 (*Extrinsically Motivated*) was the largest (31.47%) and described students presenting average global levels of self-determined motivation, intrinsic motivation, identified regulation and introjected regulation, coupled with moderately high levels of external regulation and low levels of amotivation. Finally, Profile 4 (*Amotivated*) corresponded to 27.5% of the sample presenting very low global levels of self-determined motivation, low levels of intrinsic motivation and identified regulation, moderate levels of introjected motivation, average levels of external regulation and very high levels of amotivation.

Latent transitions

The latent transition probabilities estimated from the final LTA solution (based on the longitudinal LPA of distributional similarity) are reported in Table 3. The *Amotivated* profile was the most stable, with 85.1% of students belonging to this profile at T1 remaining in this profile at T2. As for the other profiles, membership was also quite stable: 71.8% for the *Moderately Motivated* profile, 70.7% for the *Self-Determined* profile and 68.8% for the *Extrinsically Motivated* profile. In terms of profile transitions, the main transition for *Self-Determined* students at T1 was towards the *Moderately Motivated* profile (15.5%) at T2, followed by the *Extrinsically Motivated* profile (13.8%). No student transitioned from the *Self-Determined* profile at T1 to the *Amotivated* profile at T2. For *Moderately Motivated* students at T1, the main transition was towards the *Extrinsically Motivated* profile (17.2%) at T2, followed by the *Self-Determined* (6.5%) and *Amotivated* (4.6%) profiles. For *Extrinsically Motivated* students at T1, the main transition was towards the *Self-Determined* profile (13.8%) at T2, followed by the *Moderately Motivated* (9.1%) and *Amotivated* (8.3%) profiles. Finally, 10.5% of *Amotivated* students at T1 transitioned to the *Moderately Motivated* profile at T2, whereas only 3.9% of them transitioned to the *Extrinsically Motivated* profile (3.9%). Very few students (.6%) transitioned from this profile to the *Self-Determined* profile at T2. Overall, these results did not fully support our second hypothesis as the stability of profile membership was similar across all four profiles.

Predictors of profile membership

The results from the predictive models are reported in the bottom of Table 2 and revealed that the lowest values on all information criteria were associated with the model of predictive similarity, which was retained for interpretation. These results suggest that the relations between predictors and profiles are

TABLE 2 Results from the longitudinal latent profile analyses and latent transition analyses.

3-profile solution	LL	#fp	SC	AIC	CAIC	BIC	ABIC	Entropy
Longitudinal latent profile analyses								
Configural similarity	−14,886.846	102	1.133	29,977.692	30,647.878	30,545.878	30,221.821	.477
Structural similarity	−14,921.257	78	1.213	29,998.513	30,511.008	30,433.008	30,185.200	.442
Dispersion similarity	−14,931.898	54	1.409	29,971.796	30,326.600	30,272.600	30,101.041	.441
Distributional similarity	−14,933.711	51	1.418	29,969.423	30,304.515	30,253.515	30,091.487	.441
Predictive similarity								
Profile-specific free relations with predictors	−17,691.355	83	2.492	35,548.709	36,113.394	36,030.394	35,766.684	.493
Free relations with predictors	−17,638.481	131	1.651	35,538.962	36,430.212	36,299.212	35,882.994	.556
Equal relations with predictors	−17,701.072	71	2.709	35,544.144	36,027.188	35,956.188	35,730.604	.491

Abbreviations: #fp, Number of free parameters; ABIC, Sample-Size adjusted BIC; AIC, Akaike Information Criteria; BIC, Bayesian Information Criteria; CAIC, Constant AIC; LL, Model Loglikelihood; SC, Scaling factor associated with MLR loglikelihood estimates.

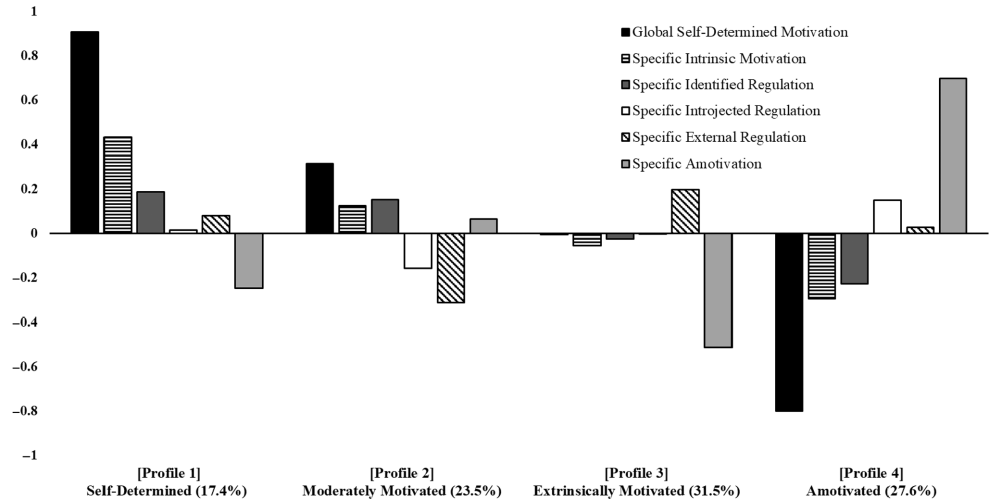

FIGURE 2 Final 4-Profile solution selected at both time points (Distributional pimilarity). *Note*: The profile indicators are estimated from factor scores with mean of 0 and a standard deviation of 1.

equivalent across T1 and T2 and that the predictors do not contribute to specific profile-to-profile transitions (Morin & Litalien, 2019). The final set of predictive results taken from this model is reported in Table 4 and is consistent with our third hypothesis. These results show that students who report being exposed to high levels of need-nurturing characteristics from their program, as well as those displaying high levels of trait self-control, were more likely to belong to the *Self-Determined* profile relative to the other profiles, and to the *Moderately Motivated* and *Extrinsically Motivated* profiles relative to the *Amotivated* profile. Next, older students were more likely to belong to the *Self-Determined* profile relative to the other profiles. Finally, male students were less likely to belong to the *Extrinsically Motivated* profile relative to the *Moderately Motivated* and *Amotivated* profiles.

DISCUSSION

This study sought to document the nature and stability of university students' academic motivation profiles before and during the COVID-19 pandemic, as well as the role played by the need-nurturing characteristics of the educational program and of trait self-control as possible predictors of profile membership. Our results revealed four academic motivation profiles, which remained identical over time and showed that student membership in these profiles remained highly stable between T1 (before the pandemic) and T2 (12 months later, during the pandemic). Consistent with our hypotheses, our results also highlighted the key roles of the need-nurturing educational climate of the study programs and of trait self-control in predicting membership to more adaptative profiles.

Academic motivation profiles

Supporting Hypothesis 1, our results revealed that four profiles best represented the configurations of academic motivation among our sample of university students. First, the *Self-Determined* profile was the most adaptative and represented students who attend university primarily for autonomously driven reasons. Next, the *Moderately Motivated* profile described students who primarily experience autonomous forms of motivation, which, however, coexist with a certain degree of amotivation. Thus, although these students seem to enjoy their schoolwork, they also sometimes appear to question the reasons that lead them to pursue their studies. In contrast, the *Extrinsically Motivated* profile represented students who are

TABLE 3 Latent transition probabilities.

	Probability of transition at time 2 to…			
Time 1 profile membership	**Profile 1 (Self-determined)**	**Profile 2 (Moderately motivated)**	**Profile 3 (Extrinsically motivated)**	**Profile 4 (Amotivated)**
Profile 1 (Self-determined)	.707	.155	.138	.000
Profile 2 (Moderately motivated)	.065	.718	.172	.046
Profile 3 (Extrinsically motivated)	.138	.091	.688	.083
Profile 4 (Amotivated)	.006	.105	.039	.851

TABLE 4 Results for the effects of the predictors on profile membership (Predictive similarity).

	Self-determined (1) vs. moderately motivated (2)		Self-determined (1) vs. extrinsically motivated (3)		Self-determined (1) vs. amotivated (4)	
	Coefficient (*SE*)	OR	Coefficient (*SE*)	OR	Coefficient (*SE*)	OR
Need-nurturing educational climate	.854 (.152)**	2.348	.666 (.118)**	1.946	1.690 (.138)**	5.419
Trait self-control	.640 (.161)**	1.896	.511 (.130)**	1.667	1.205 (.156)**	3.337
Sex	−.370 (.223)	.691	.179 (.202)	1.196	−.224 (.219)	.799
Age	.047 (.019)*	1.049	.034 (.016)*	1.034	.051 (.019)*	1.052
	Moderately motivated (2) vs. Extrinsically motivated (3)		**Moderately motivated (2) vs. Amotivated (4)**		**Extrinsically motivated (3) vs. Amotivated (4)**	
	Coefficient (*SE*)	OR	Coefficient (*SE*)	OR	Coefficient (*SE*)	OR
Need-nurturing educational climate	−.188 (.101)	.829	.836 (.107)**	2.308	1.024 (.091)**	2.786
Trait self-control	−.129 (.131)	.879	.565 (.140)**	1.760	.694 (.121)**	2.002
Sex	.549 (.191)*	1.732	.145 (.185)	1.156	−.404 (.183)*	.668
Age	−.014 (.019)	.986	.003 (.020)	1.003	.017 (.017)	1.017

Note: The coefficients and ORs reflect the effects of the predictors on the likelihood of membership into the first listed profile relative to the second-listed profile. *$p < .05$. **$p < .01$.

Abbreviations: OR, odds ratio; *SE*, standard error.

mainly driven by controlled forms of motivation. Importantly, this profiles also displays low levels of amotivation coupled with average levels on all other motivational indicators, suggesting a certain degree of adaptivity. Finally, the *Amotivated* profile described students who experience very high levels of amotivation combined with very low levels of autonomous motivations. This profile is, therefore, highly maladaptive and represents students who seem to lack a reason to engage and persevere in their studies. Overall, the nature and shape of these four profiles are aligned with previous person-centred results in the education domain (Bechter et al., 2018; Gillet et al., 2017; Tóth-Király et al., 2022; Wang et al., 2016).

Importantly, this 4-profile solution was completely replicated at both time points, supporting its longitudinal within-sample stability. Thus, despite the turmoil caused by the COVID-19 pandemic in students' educational experience, the basic configurations underlying their motivation profiles remained stable. Noteworthy, our participants were all first-year undergraduate students at the start of the study, which added another potential source of instability as new students are known to progressively adapt to the new reality of university life (Dyson & Renk, 2006). Our results thus clearly indicate that the impact of the lockdown measures imposed during the COVID-19 pandemic remained minimal in relation to the academic motivation profiles of university students. Our results thus add to those of previous research revealing that the nature and structure of academic motivation profiles tend to remain quite stable over time (Gillet et al., 2017; Xie et al., 2022).

Above this high within-sample stability, our results also revealed moderately high levels of within-person stability in profile membership, as only around 25 to 30% of our sample migrated to a different profile at T2. This moderately high level of within-person stability was the highest for the *Amotivated* profile (85.1%) while stability in profile membership ranged between 68.8% and 71.8% for the other profiles. Importantly, the stability of the *Self-Determined* profile (70.7%) was close to that observed in previous person-centred research conducted among university students (stability of 75.9% for the *Autonomous* profile in Gillet et al., 2017). Moreover, none of the students who initially belonged to this

profile migrated to the *Amotivated* profile at T2, suggesting that the *Self-Determined* profile remained the most desirable from a transitional perspective. Beyond this specific observation, no other clear positive or negative transitional pattern emerged from our results. Indeed, while approximately 13% of our participants migrated to a less adaptative profile over time, approximately the same proportion experienced positive changes by 'upgrading' to a more adaptative profile at T2.

These results globally suggests that the lockdown measures imposed during the COVID-19 pandemic did not result in any major change in the motivational landscape of most university students. Contrary to Hypothesis 2, it thus appears that university students' autonomous motivation did not follow a negative trend following the onset of the pandemic. However, it is important to point out that at each measurement occasion, only a small proportion (<20%) of our participants experienced a *Self-Determined* motivation profile, while almost 60% of them experienced a profile dominated either by external regulation or amotivation. Moreover, some students did worse than others when facing the pandemic, either by maintaining their membership into an undesirable profile or by switching to a less adaptative profile. These results highlight the importance of examining factors that might have played a role in shaping these configurations before and during the pandemic.

The role of educational climate and trait self-control

In support of Hypothesis 3, we found that students who reported being exposed to high levels of need-nurturing conditions, as well as those with a greater capacity for self-control, were more likely to belong to the *Self-Determined* profile relative to any other profile. These students were also more likely to belong to the *Moderately Motivated* or *Extrinsically Motivated* profiles relative to the *Amotivated* one. In other words, a good need-nurturing educational climate and high levels of trait self-control seemed to be particularly important to the prediction of membership into profiles characterized by high levels of self-determined forms of motivation (*Self-Determined* and *Moderately Motivated* profiles) and low levels of amotivation (*Extrinsically Motivated* profile). These results are particularly robust, as they are equivalent over time and obtained while controlling for sex and age.[2]

These findings have many implications for research and practice. First, they match Gilbert et al.'s (2021, 2022) propositions in demonstrating the importance of supporting university students' psychological needs at a more general level (i.e., study program) to foster positive forms of functioning. In the present situation, supporting students' psychological needs seems to have helped them develop or maintain more optimal motivation profiles in the context of the COVID-19 pandemic (T2), but also in a more normative context (T1). It may thus be worthwhile for universities to invest in interventions designed to provide students with sufficient opportunities to fulfil their needs for autonomy, competence and relatedness through their study programs (Gilbert et al., 2021, 2022; Ryan & Deci, 2020). Second, our findings add to an emerging literature arguing for the importance of trait self-control in determining the quality of students' academic motivation (Converse et al., 2019; Holding et al., 2019). In this regard, our results refine those obtained in these previous studies by illustrating that the benefits of trait self-control generalize to the consideration of motivation profiles. Interventions should thus also focus on accompanying students in developing their self-control abilities, which could be done by helping them master a variety of self-deployed strategies aiming at facilitating self-control (e.g., goal setting, planning, self-monitoring; see Duckworth et al., 2018).

[2]Although sex and age were only included as controlled variables, some results associated with these variables are worth mentioning. First, older students were more likely to belong to the *Self-Determined* profile, which is aligned with previous research revealing a positive relation between age and autonomous motivation (Gillet et al., 2017; Stynen et al., 2014). Second, men were less likely than women to correspond to the *Extrinsically Motivated* profile relative to the *Moderately motivated* and *Amotivated* profiles. This result suggests that, relative to women, men lacking a purely self-determined profile seemed less likely to engage in their studies for purely externally driven reasons and more likely to experience amotivation (Vallerand et al., 1989, 1992).

Limitations and future directions

This study has limitations that should be addressed in future research. First, it relied entirely on self-report measures, which are known to be prone to social desirability and self-evaluation biases. Although these measures were useful to capture students' perceptions of the educational climate, this study lacked more objective information on the characteristics, which generated these perceptions. Future studies could include other sources of information regarding the evaluation of the educational climate, such as an external and objective evaluation of study program components. Second, our sample includes a majority of women (roughly 80%) who were on the average slightly older than expected for first-year university students (roughly 22 years old). In addition, an important proportion of T1 participants did not complete the T2 questionnaire, meaning that latent transitions could only be estimated based on the subset of participants who completed both time points. These limitations impair the generalizability of our results to the whole population of university students and should, therefore, be considered when interpreting the present findings. Third, this study assessed motivation profiles stability across two time points separated by a 12-month interval. Future longitudinal research should include at least three time points to examine the consistency and stability of motivation profiles more thoroughly across time. Lastly, we only considered a limited number of variables in the prediction of profile membership. We thus cannot rule out that other individual or contextual factors might have played a role in shaping students' motivational experiences.

CONCLUSION

Relying on a person-centred perspective, this study suggests that the closure of campuses and the hasty shift to distance learning that followed the COVID-19 outbreak did not profoundly alter university students' motivational landscape. Indeed, most students maintained the same motivational profile over time and some students even developed a more adaptative configuration of motivation despite exposure to these unfavourable learning conditions. A need-nurturing educational climate and high levels of trait self-control seemed to protect students against endorsing controlled forms of motivations and amotivation both before and during the pandemic, suggesting that these factors should be targeted for intervention purposes.

AUTHOR CONTRIBUTIONS

William Gilbert: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; writing – original draft. **Julien S. Bureau:** Conceptualization; funding acquisition; investigation; methodology; project administration; resources; supervision; writing – review and editing. **Abdoul Diallo:** Writing – review and editing. **Alexandre J. S. Morin:** Writing – review and editing. **Frédéric Guay:** Conceptualization; funding acquisition; investigation; methodology; project administration; resources; supervision; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

The datasets generated during and/or analysed during the current study are available on request from the corresponding author.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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