On the Nature, Predictors, and Outcomes of Undergraduate Students Psychological Distress Profiles

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Abstract

Although it is well known that psychological distress is a widespread phenomenon among undergraduate students, especially in the aftermath of the COVID-19 pandemic, research on the heterogeneity of the psychological distress manifestations observed in this population is still lacking. This study sought to investigate the nature of psychological distress profiles among a sample of 1053 undergraduate students (78.2% female; M_{age} = 22.60, SD_{age} = 4.72) who completed our measures roughly six months into the COVID-19 pandemic. Levels of depression, generalized anxiety, performance anxiety, and emotional exhaustion were evaluated while also accounting for participants' global levels of distress across all types of manifestations. Moreover, we also considered the role played by contextual (university educational climate) and individual (student trait self-control) factors as predictors of profile membership, while controlling for students' sociodemographic characteristics (age, sex, residence status, parental education level, and immigration status). Finally, students' levels of suicidal ideation and risk behaviors (substance use, sedentary time, and fast-food consumption) were contrasted across profiles. Our analyses revealed five quantitatively and qualitatively distinct profiles of psychological distress (*Low Distress*, *Emotional Exhaustion*, *Performance Anxiety*, *General Distress*, and *Exhausted with Performance Anxiety*). Controlling for sociodemographic characteristics, a need supportive educational climate and higher levels of trait self-control predicted a higher likelihood of membership into the most adaptive profiles (e.g., *Low Distress*). Lastly, membership to the *General Distress* and *Exhausted with Performance Anxiety* profiles were associated with the least desirable outcomes.
Keywords: University students; psychological distress; educational climate; self-control; risk behaviors

Statements and Declarations

The high prevalence of psychological distress manifestations among university students is a critical concern for universities internationally (Sharp & Theiler, 2018). Past studies have shown that close to 70% of university students experience at least subclinical levels of psychological distress while up to 35% experience enough distress to meet diagnostic criteria for psychological disorders such as major depression or generalized anxiety disorder (Auerbach et al., 2018; Stallman, 2010). These proportions have spiked after the onset of the COVID-19 pandemic, with studies revealing rates of clinically significant depression or anxiety reaching 50% among students after the implementation of confinement-related procedures (e.g., campus closures, transition to distance learning; Hamza et al., 2021; Ghazawy et. al., 2021; Li et al., 2021). This situation is problematic because psychological distress is likely to interfere with students' learning and academic performance, both directly and by fostering risk behaviors likely to further threaten students' health and functioning (Sharp & Theiler, 2018). Indeed, research has shown that students suffering from psychological distress were more likely to develop suicidal thoughts and behaviors (Tang et al., 2018), to use psychoactive substances such as alcohol and cannabis (Deasy et al., 2015; Lechner et al., 2020), to reduce their engagement in physical activity (Knowlden et al. 2015; Short et al., 2021), and to adopt an unhealthy diet (Deasy et al., 2014; Peltzer & Pengpid, 2017). These risk behaviors are known to impair students' learning capacity and academic achievement (Burrows et al., 2017; Curcio et al., 2006; Whatnall et al., 2022) and to persist throughout adulthood when adopted in university, thereby increasing students' risk of developing physical and psychological health problems later in life (Visser & Hirsch, 2014)

Although numerous studies have investigated the prevalence of psychological distress among university students (Sharp & Theiler, 2018), little is currently known about the profiles underlying the various manifestations of distress in this population. Indeed, not all distressed individuals display the same configuration of symptoms, and achieving a better understanding of which configurations are most common should help develop targeted interventions (Allsopp et al., 2019; Feczko et al., 2019). To shed light on this question, this study relies on a person-centered approach to (a) identify the profiles that best reflect students' configurations of psychological distress encompassing academic (emotional exhaustion and performance anxiety) and non-academic (depression and generalized anxiety) manifestations of distress; (b) determine whether and how students' perceptions of their university's educational climate, their levels of trait self-control, and their sociodemographic characteristics (age, sex, residence status, parental education level, and immigration status) predict their likelihood of belonging into specific profiles; and (c) investigate whether and how these profiles are associated with students' suicidal ideation, substance use, sedentary behaviors, and fast-food consumption.

Psychological Distress in University Students

As a broad construct, psychological distress describes a state of emotional suffering encompassing symptoms of depression (e.g., sadness, hopelessness) and general anxiety (e.g., feeling on-edge, restlessness) (Drapeau et al., 2012). These two manifestations of distress have been at the center of research conducted on university students' mental health as highlighted in multiple systematic reviews on their prevalence in this population (e.g., Gao et al., 2020; Ibrahim et al., 2013; Li et al., 2022; Paula et al., 2020; Sarokhani et al., 2013; Sheldon et al., 2021). However, beyond depression and general anxiety, psychological distress is also characterized by more specific manifestations of distress that are tied up to specific situations or life domains, such as education (Ridner, 2004; Veit & Ware, 1983). More precisely, performance anxiety and emotional exhaustion are two manifestations of distress that are highly prevalent among university students. For instance, more than half of this population has been shown to display very high levels of anxiety related to their education, with the main reported sources of concern being related to fear of failure and academic performance (i.e., performance anxiety; Beiter et al., 2015; Fauzi et al., 2021; Hurst et al., 2013; Wahed & Hassan, 2017). A similar proportion of students has also been shown to experience emotional exhaustion in relation to the requirements of their studies (e.g., academic workload, exams; Rosales-Ricardo et al., 2021). Emotional exhaustion has long been identified as the core component of academic burnout, the one with the most deleterious effects on functioning and well-being, and the one which arguably develops first in the burnout sequence (e.g., Arens & Morin, 2016; Parker & Salmela-Aro, 2011). In sum, university students can develop manifestations of psychological distress that are both general (e.g., depression and generalized anxiety) and specific to their education (e.g., performance anxiety and emotional exhaustion), highlighting the importance of considering the multidimensionality of students' mental health.

A Person-Centered Perspective on Psychological Distress

To date, most studies focusing on university students' psychological distress have relied on a

variable-centered approach. This approach focuses on the average levels of psychological distress, and on the average associations between these levels and various predictors and outcomes, based on the expectation that these associations generalize to the entire population under study (Meyer & Morin, 2016). This approach is limited by its inability to account for the fact that not all students suffering from psychological distress experience the same configuration of symptoms, and that these configurations may each entail a unique subjective experience of distress that reflects more than the simple sum of different types of symptoms. Person-centered analyses are well suited to address this limitation as they are designed to identify qualitatively distinct profiles of students each characterized by a different configuration (or shape) of psychological distress manifestations (Morin & Litalien, 2019). For instance, a specific profile of students could suffer from high levels of performance anxiety while experiencing low levels on other manifestations of distress (e.g., depression, emotional exhaustion, and generalized anxiety), whereas another profile could experience high levels of emotional exhaustion and generalized anxiety combined with low levels of depression and performance anxiety. Person-centered analyses make it possible to uncover these qualitatively distinctive configurations, and to assess their associations with predictors and outcomes, thus resulting in a more nuanced, realistic, and holistic portrait of students' psychological distress.

Despite the expected benefits of a person-centered approach, results from the few available person-centered studies of university students' psychological distress have mainly uncovered profiles differing quantitatively from one another (i.e., where all types of symptoms have similar levels within each profile, so that these profiles differ only in terms of severity rather than shape) rather than qualitatively (i.e., where all profiles present a distinct configurations of symptoms)[1]. For instance, based on 13 indicators of psychological distress, Hurlocker et al. (2022) identified four identical profiles simply differing in terms of severity (i.e., slight, mild, moderate, and severe) across all 13 indicators. Similarly, Browning et al. (2021), using a single indicator of psychological distress, identified three profiles characterized by low, medium, and high levels of distress. These results suggest that a multidimensional person-centered approach brings little added-value relative to variable-centered analyses focused on a single global indicator of psychological distress, while also suggesting that it might be irrelevant to differentiate among various psychological distress manifestations.

However, Morin et al. (2016b, 2017) demonstrated that, with multidimensional constructs such as psychological distress for which a global construct is known to underpin distinct conceptually related dimensions (i.e., students' global levels of psychological distress across various dimensions), ignoring the presence of this global construct when estimating profiles (i.e., considering only its separate components) will mask important qualitative differences related to the shape of the profiles. This is particularly important in the present situation given that research has previously shown that psychological distress follows a multidimensional structure best represented by a model including specific factors reflecting the unique nature of each distress dimension along with a global factor (also called the general psychopathology factor, or P-factor) that unites these dimensions and reflects overarching levels of psychopathology severity (Caspi et al., 2014; Forbes et al., 2021; Smith et al., 2020). More precisely, all manifestations of psychological distress share a common core, as well as truly unique features (e.g., sadness, performance anxiety, exhaustion), all of which have different implications for functioning and treatment (Caspi et al., 2014). The fact that none of the previously reported person-centered studies on university students jointly considered the multidimensionality of psychological distress (i.e., global levels of distress together with the extent to which specific distress manifestations deviate from these global levels) could potentially explain their identification of profiles differing only in terms of severity (quantitatively) but not in terms of shape or configuration of symptoms (qualitatively). Therefore, estimating profiles of psychological distress while relying on a proper disaggregation of students' global and specific levels of distress should help uncover important differences in relation to the configuration of distress manifestations, thus better highlighting the

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[1] In person-centered research (Morin & Marsh 2015), qualitative differences refer to profiles displaying different *shapes*, that is different configurations on the indicators used to estimate these profiles. For instance, one profile could be dominated by performance anxiety while maintaining low levels on other manifestations of distress, whereas another one could display high levels of depression and emotional exhaustion but low levels of generalized anxiety and performance anxiety. Quantitative differences refer to profiles displaying different *levels* of severity across all indicators. For instance, profiles could simply present low, moderate, and high levels across all indicators. The utility and relevance of a person-centered approach lies in its ability to uncover qualitative differences (Morin & Marsh, 2015).

heterogeneity present within this population (Morin et al., 2016b, 2017).

Predictors of Psychological Distress Profiles

Identifying factors that can be targeted to protect university students against the development of psychological distress has long been acknowledged as an important target for the development of efficient preventive interventions (Sharp & Theiler, 2018). Recently, studies anchored in self-determination theory (SDT; Ryan & Deci, 2017) have highlighted how the educational climate may impact university students' psychological distress (Gilbert et al., 2021, 2022). SDT proposes that student development and functioning are closely related to the extent to which their three basic psychological needs (BPNs) for autonomy (i.e., experiencing a sense of volition), competence (i.e., experiencing a sense of mastery), and relatedness (i.e., experiencing a sense of belongingness) are satisfied and frustrated. While need satisfaction is purported to foster psychological growth and well-being, need frustration should lead to maladjustment and symptoms of ill-being (Vansteenkiste et al., 2020). SDT suggests that the extent to which student BPNs are satisfied or frustrated largely depends on socio-contextual factors specific to the university context, meaning that students must be provided with optimal conditions and opportunities to develop their sense of autonomy, competence, and relatedness as part of their studies (Ryan & Deci, 2020).

From this perspective, Gilbert et al. (2021, 2022) showed that when students perceive that their program offers them need-nurturing conditions and opportunities, they tend to experience lower levels of psychological distress. An educational climate that offers need-supportive or nurturing conditions promote student autonomy (e.g., having the opportunity to choose from several course options), competence (e.g., having quick and easy access to clear information on the curriculum), and relatedness (e.g., having the opportunity to get to know teachers and peers through organized events) (Gilbert et al., 2021). Conversely, need-thwarting conditions are those that lead to a sense of external control (e.g., not being able to share comments and suggestions for improving the curriculum), chaos (e.g., having to deal with confusing and constantly changing information relative to the curriculum), and social disconnection (e.g., having to cut social life to cope with the workload; Gilbert et al., 2021). Gilbert et al. (2021) showed that a need-supportive educational climate was negatively linked to students' anxiety and depression while a need-thwarting educational climate was positively associated with these indicators of psychological distress. These associations were also observed after the onset of the COVID-19 pandemic, suggesting that a need-nurturing educational climate potentially helped minimize the impact of campus closure on student mental health (Gilbert et al., 2022). In other words, providing students with different options to choose from to complete their courses and assessments, with different means of educational support, with a clear line of communication and with opportunities for (remote) social interactions was beneficial for helping students adjust to the sudden shift from classroom to distance learning.

Beyond contextual factors such as the educational climate, students' characteristics are also important to consider as they can increase or decrease their risk of experiencing psychological distress (Sheldon et al., 2021). Among those characteristics is students' trait self-control, which is defined as the ability to down-regulate undesirable behaviors, thoughts, and emotions, especially when facing temptations and impulses, to support the pursuit of long-term goals (Baumeister & Heatherton, 1996; Duckworth, 2011). Previous studies have shown that self-control was a protective factor against psychological distress in many populations (Tangney et al., 2004), including university students (Gilbert et al., 2022; Morrison & Pidgeon, 2017; Powers et al., 2020). This can be explained by the fact that students with low self-control tend to use maladaptive coping mechanisms when facing academic stressors, including denial, avoidance, and procrastination (De Ridder & Gillebaart, 2017; Powers et al., 2020). In the context of the COVID-19 pandemic, Hamdan et al. (2021) showed that students with a greater capacity for self-control were able to adapt more efficiently to the hasty switch to online learning, regardless of other factors such as teaching quality. In doing so, these students reported lower levels of anxiety compared to students with lower self-control abilities.

In addition to self-control, students' sociodemographic characteristics have also been shown to be associated with their propensity to experience psychological distress (for reviews, see Sharp & Theiler, 2018; Sheldon et al., 2021). For instance, female students have consistently been found to report higher levels of psychological distress than male students, and younger students have also been found to be present a higher risk of experiencing psychological distress (Sheldon et al., 2021; Velten et al., 2018). Moreover, being an international student, living alone, and coming from less educated parents were also identified as factors related to the experience of higher levels of psychological distress among

university students (Chen et al., 2013; Cadenas & Nienhusser, 2021; Husky et al., 2020; ul Haq et al., 2018). Although these sociodemographic characteristics are mainly non-modifiable, and therefore cannot be the object of intervention, they can help universities target students presenting a higher risk of developing and experiencing psychological distress to better support them (Sheldon et al., 2021). This is especially salient in the context of the COVID-19 pandemic where sociodemographic characteristics (e.g., being female, younger, and immigrant, having a low socioeconomic status, living alone) were shown to represent key risk factors for exacerbated distress (Garcini et al., 2022; Xiong et al., 2020) and represented easy to access information about the students in a context characterized by limited social interactions. To our knowledge, no previous studies have considered how these sociodemographic characteristics, along with students' trait self-control and their perceptions of the educational climate of their programs, were related to their psychological distress profile.

Outcomes of Psychological Distress Profiles

Psychological distress leads to emotional turmoil and mental discomfort that can greatly impair many facets of students' functioning (Sharp & Theiler, 2018). Among the most important consequences of psychological distress in university students is an increased tendency towards suicidal ideation. Indeed, variable-centered research conducted with this population has demonstrated the presence of strong positive associations between psychological distress manifestations (e.g., depression, performance anxiety) and suicidal ideation (Ang & Huan, 2006b; Eisenberg et al., 2007; Tang et al., 2018). Some studies have even indicated that more than 60% of students suffering from symptoms of psychological distress will experience suicidal ideation at least once during their university studies, and that most of them will not seek any medical attention to help them deal with their psychological difficulties (Lee et al., 2021; Schweitzer et al., 1995; Tang et al., 2018). In the context of the COVID-19 pandemic, not only has the prevalence of psychological distress increased, but it was also reported that roughly 15% of students expressed suicidal ideation right after campus closures (Tasnim et al., 2020).

Furthermore, psychological distress has also been associated with many risk behaviors that can impair students' academic functioning while also threatening their current and future physical and psychological health. Among those behaviors are the use of alcohol and cannabis. Alcohol and cannabis consumption has long been acknowledged as a popular leisure activity among university students (Shinew & Perry, 2017). However, for many students, the use of alcohol and cannabis goes beyond leisure and helps to cope with symptoms of psychological distress, leading to a risk of excessive and problematic use of these substances (Chang et al., 2022; Deasy et al., 2014; 2015; Phillips et al., 2017). This trend has worsened following the onset of the COVID-19 pandemic, as many students with symptoms of psychological distress have reported an increase in their alcohol and cannabis intake to levels exceeding recreational use after campus closures (Lechner et al., 2020; Yehudai et al., 2020). Although controlled use of small doses of cannabis can alleviate some manifestations of psychological distress (e.g., stress, anxious symptoms; Health Canada, 2018; National Academies of Sciences, Engineering, and Medicine, 2017), uncontrolled self-medication procedures are also likely to amplify these symptoms (Windle et al., 2019). Although many students report being aware of such risk, an important proportion of them also reports not knowing any other successful way of coping with their symptoms of psychological distress (Yehudai et al., 2020).

Lastly, sedentary behaviors and an unhealthy diet are two other categories of risk behaviors that have been associated with psychological distress among university students (Knowlden et al., 2016; Short et al., 2021). Research has shown that students suffering from anxiety are less inclined to engage in physical activity compared to their non-anxious peers (Short et al., 2021), whereas depressed students spend more time sitting (Zeng et al., 2019). Moreover, depressed students tend to eat more fast food, while their non-depressed peers are more likely to report a more balanced diet that meets daily recommendations in terms of fruits and vegetables intake (Peltzer & Pengpid, 2017). Increases in anxiety and depression were found to predict matching decreases in healthy dietary behaviors (Deasy et al. 2014; Peltzer & Pengpid, 2017). Overall, these results are aligned with the idea that psychological distress is an important precursor for the development of unhealthy lifestyle behaviors (Kubzansky et al., 2014). To date, however, only a limited number of studies have assessed the associations between profiles of psychological distress and university students' suicidal ideation, substance use, sedentary behaviors, and fast-food consumption. This gap limits our knowledge regarding the configurations of symptoms that are more likely to foster these undesirable outcomes among this population.

The Present Study

In this study, we first seek to identify and estimate the prevalence of the most commonly occurring profiles of psychological distress among a sample of Canadian university students during the COVID-19 pandemic (Fall 2020). In estimating these profiles, we consider students' specific levels of depression, emotional exhaustion, generalized anxiety, and performance anxiety, while also jointly accounting for their global level of distress across all these indicators (see Figure 1 for an illustration of this measurement model). Based on the number of profiles identified in the few previous person-centered studies on university students' psychological distress (Browning et al., 2021; Fernández et al., 2020; Hurlocker et al., 2022), we hypothesize that a solution comprising at least three psychological distress profiles will be identified (Hypothesis 1a). Furthermore, given our joint consideration of students' global and specific levels of psychological distress, we expect these profiles to differ qualitatively from one another, as outlined by Morin et al. (2016b, 2017) (Hypothesis 1b). More precisely, we expect each profile to be characterized by a distinctive shape reflecting a unique configuration of psychological distress manifestations. However, we leave the nature of these configurations as an open research question. Second, we assess the role of the educational climate and students' trait self-control as predictors of participants' likelihood of belonging to each of the profiles. Based on previous studies (Gilbert et al., 2021; 2022; Powers et al., 2020), we hypothesize that perceived exposure to a need nurturing educational climate (Hypothesis 2a) and trait self-control (Hypothesis 2b) will predict a lower likelihood of membership into profiles characterized by the most maladaptive configurations of psychological distress manifestations (e.g., high levels on multiple specific indicators of distress and/or on the global distress indicator). We also expect these results to be obtained while controlling for sociodemographic characteristics known to be associated with university students' psychological distress (i.e., age, sex, residence status, parental education level, and immigration status; Bourion-Bédès et al., 2021; Cadenas & Nienhusser, 2021; Husky et al., 2020; ul Haq et al., 2018; Van de Velde et al., 2010) (Hypothesis 2c). Finally, we assess whether and how the profiles will be related to students' levels of suicidal ideation and risk behaviors (i.e., substance use, sedentary time, and fast-food consumption). Based on previous studies (Deasy et al., 2014; 2015; Chang et al., 2022; Short et al., 2021; Tang et al., 2018), we expect profiles characterized by the most maladaptive configurations of psychological distress manifestations to be related to higher levels of suicidal ideation (Hypothesis 3a) and more frequent risk behaviors (Hypothesis 3b).

Method

Procedure and Participants

This study relies on a convenience sample of undergraduate students. The data was collected in the fall 2020 semester in two French-language universities located in the Canadian province of Quebec. In Quebec, all University campuses were closed at this moment, making this semester the first to be completely offered remotely to all university students in the province. An email was sent to all undergraduate students (N = 12,153) enrolled in the second year of a disciplinary baccalaureate (i.e., focusing a single area of knowledge) asking them to answer an online questionnaire. A total of 1053 students (female = 78.2%, M_{age} = 22.60, SD_{age} = 4.72) agreed to take part in the study (response rate of 8.66%). Participation was completely voluntary and anonymous. This study was approved by the research ethics committee of the third and fourth authors' institution (2018-323 A-7/02-11-2020).

Measures

Psychological distress

Psychological distress was assessed using measures of depression, generalized anxiety, performance anxiety, and emotional exhaustion. Depression was assessed using the French version of the Patient Health Questionaire-9 (PHQ-9; Carballeira et al., 2007). Participants rated nine items, using a 4-point scale (0 = *never* to 3 = *almost every day*), based on how often they experienced each symptom over the past 14 days (e.g., "Being sad, depressed, or hopeless", "Difficulty falling asleep or staying asleep, or sleeping too much"; α = .88). Generalized anxiety was measured using the French version of the Generalized Anxiety Disorder 7-item scale (GAD-7; Micoulaud-Franchi et al., 2016). Participants rated each item on a 4-point scale (0 = *never to* 3 = *almost every day*) based on the presence of each symptom over the past 14 days (e.g., "Difficulty relaxing", "Easily upset and/or irritated"; α = .91). Emotional exhaustion was assessed using the French version of the emotional exhaustion subscale of the Maslach Burnout Inventory (MBI; Maslach et al. 2006). Participants were asked to rate nine items, using a 7-point scale (0 = *never* to 6 = *every day*), to indicate how often they tend to experience each symptom as part of their studies (e.g., "I feel burned out from my studies", "I feel emotionally drained by my studies"; α = .93). Lastly, performance anxiety was measured using the French version of the

expectations of self subscale from the Academic Expectations Stress Inventory (AESI; Ang & Huan, 2006a). Participants were asked to rate three items on a 5-point scale (1 = *not at all true* to 5 = *very true*) to indicate the extent to which they tend to experience each symptom as part of their studies (e.g., "I feel stressed when I am not up to my own standards", "When I do not succeed as well as I would have on an exam or test, I feel stressed"; α = .84).

Predictors

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…", participants answered items measuring autonomy support (e.g., "A variety of options (courses, teachers, length of study) is made available to students"; α = .75), competence support (e.g., "Information about the program is easily and quickly accessible"; α = .82), relatedness support (e.g., "There are events that allow students to get to know their teachers better"; α = .86), autonomy thwarting (e.g., "Students cannot make choices to influence the content of their studies"; α = .79), competence thwarting (e.g., "Administrative officials do not communicate to students the important decisions that affect their progress"; α = .79), and relatedness thwarting (e.g., "The workload is so intense that students' social relationships suffer"; α = .90). Each subscale includes four items that were answered on a 7-point scale (1 = *completely false* to 7 = *completely true*). Participants' trait self-control was measured using the French version of the Brief Self-Control Scale (BSCS; Brevers et al., 2017). This 13-item measure assesses their (in)ability to withhold immediate gratifying temptations and behaviors to reach long-term goals (e.g., "I have difficulties concentrating", "I often engage in bad things for myself if pleasurable"; α = .85). Items were rated on a 5-point scale (1 = *not at all* to 5 = *strongly*) and were recoded so that higher scores reflected higher levels of trait self-control.

Outcomes

Suicidal ideation was assessed using three items inspired from Korczak et al.,'s (2015) recommendations: "To what extent do you wish to die?", "To what extend do you think about ending your life?", and "To what extent are you thinking about making an active suicide attempt?" (α = .88). These items were answered on a 5-point scale (0 = *not at all* to 4 = *strongly*). Next, risk behaviors were assessed with items derived from surveys used by the government of Quebec (provincial level) and Canada (federal level) as part of population health assessment surveys (Institut de la statistique du Québec, 2016; Statistics Canada, 2021). Alcohol and cannabis consumption were measured using the following two questions: "Over the last four weeks, at what frequency did you consume alcohol?" and "Over the last four weeks, at what frequency did you consume cannabis (marijuana, weed) and/or products extracted from cannabis (e.g., hashish, oil, capsules…)?". These items were answered on a 4-point scale (0 = *never* to 3 = four times or more each week). Sedentary time was measured using a single item rated on a 4-point scale (1 = *6 hours of less/day* to 6 = *13 hours and more/day*): "Over the last four weeks, how many hours on average did you spend sitting per day?". Finally, fast-food consumption was assessed using one item rated on a 4-point scale (0 = *never* to 3 = *4 times or more each week*): "Over the last 4 weeks, at what frequency did you consume meals or snacks from any type of fast-food restaurant?".

Analyses

Preliminary Measurement Models

All analyses were conducted using the maximum likelihood robust (MLR) estimator implemented in Mplus 8.8 (Muthen & Muthen, 2022). Full information maximum likelihood (FIML; Enders, 2010) was used to handle the limited amount of missing data at the item level (0.12% to 10.62%, $M = 2.07\%$). We first estimated a series of preliminary measurement models to test the structure and psychometric properties of our measures (Meyer & Morin, 2016).

We relied on bifactor exploratory structural equation models (bifactor-ESEM; Morin, 2023; Morin et al., 2016a, 2017) for the measures of psychological distress (depression, emotional exhaustion, generalized anxiety, and performance anxiety) and educational climate (autonomy, competence, and relatedness support and thwarting). Bifactor-ESEM allowed us to properly disaggregate students' global levels of psychological distress (α = .95) from their specific levels on each specific distress manifestation assessed in this study, as recommended in the research literature on the P-factor (Caspi et al., 2014; Forbes et al., 2021; Smith et al., 2020) (see Figure 1). This approach also allowed us to represent the overall need nurturing characteristics of the program educational climate (α = .94) relative

to the specific level of support and thwarting of each psychological need[2], following recent recommendations from Gilbert et al. (2021) and Tóth-Király et al. (2020) for similar measures. The bifactor component of these models allowed us to estimate a global factor encompassing the commonalities (i.e., the common core) present among all items used to measure a specific type of construct (i.e., psychological distress or educational climate), together with specific factors capturing the unique nature of each dimension of these constructs beyond their common core captured by the global factor (Morin, 2023; Morin et al., 2016a, 2017). In contrast, the ESEM component freely estimates cross-loadings among the conceptually related specific factors underpinning a specific type of construct, which has been found to result in a more accurate definition of these factors and their association with covariates, while remaining unbiased when cross-loadings are unnecessary (Asparouhov et al., 2015; Mai et al., 2018; Wei et al., 2022). This specification is also aligned with the theoretical underpinnings of psychological distress (e.g., Caspi et al., 2014) and need support/thwarting (e.g., Ryan & Deci, 2020), which assumes that these constructs are made up of interrelated and not mutually exclusive dimensions. As noted by Morin (2023), bifactor-ESEM models can be estimated in a fully confirmatory manner when relying (as we did in this study) on target rotation, which allows us to rely on an a priori specification of all factors, while "targeting" all cross-loadings to be as close to zero as possible. Lastly, the bifactor-ESEM approach has been recommended in the statistical literature as a necessary requirement to obtain profiles exhibiting qualitative differences rather than only quantitative ones in the presence of multidimensional indicators with a documented global/specific structure (Morin et al., 2016b, 2017).

Finally, we relied on CFA for the unidimensional measures of self-control and suicidal ideation. 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 et al., 2016a). These preliminary analyses are reported in the online supplements.

Latent Profile Analysis (LPA)

Latent profile analysis (LPA) was used to estimate the psychological distress profiles present in our sample. Solutions including one to eight profiles were estimated, while allowing the means, but not the variances, of the indicators to be freely estimated across profiles. Although some statistical research has suggested to also estimate the variance of the indicators freely across profiles (Diallo et al., 2016; Peugh & Fan, 2013), this free estimation often results in nonconvergence or improper solutions suggestive of overparameterization (Diallo et al., 2016). In these situations (such as in the present study), simpler solutions are advocated (Morin & Litalien, 2019), such as the one adopted in this study (which corresponds to the default estimation procedure in Mplus). To avoid local maxima, we estimated each solution with 5000 random sets of start values, 1000 iterations per start values, and retained the 200 best solutions for final stage optimization (Morin & Litalien, 2019). The optimal number of profiles was determined by considering the heuristic value, theoretical conformity, and statistical adequacy of each solution (i.e., lack of empty profiles or impossible parameter values, convergence, etc.), along with statistical indices (Marsh et al., 2009; Morin & Litalien, 2019): the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), the Consistent AIC (CAIC), the Sample-size adjusted BIC (ABIC), the Bootstrap Likelihood Ratio Test (BLRT), and the adjusted Lo-Mendel-Rubin (Lo et al., 2001) Likelihood Ratio Test (aLMR). Lower values on the AIC, CAIC, BIC, and ABIC suggest a better fitting solution, while statistically significant BLRT and aLMR support a specific solution relative to one including fewer profiles.

Importantly, statistical simulation studies have shown that some statistical indices (i.e., CAIC, BIC, ABIC, BLRT) were far more effective than the others, and should be prioritized in selecting the optimal number of profiles (Diallo et al., 2016, 2017; Peugh & Fan, 2013). For this reason, we only report the AIC and aLMR to ensure complete disclosure, but do not use them to guide our selection of the optimal solution. In addition, all of these indicators are sample-size dependant, and thus often keep on suggesting the addition of profiles even when they are no longer relevant (e.g., Marsh et al., 2009). In these situations, the information criteria can be presented in the form of an elbow plot in which a plateauing (or multiple ones) in their decrease can be used to guide the selection of potentially viable solutions (Morin & Litalien, 2019). However, the final decision regarding the optimal number of

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[2]For reasons of parsimony, we did not include the specific factors of support and thwarting of each psychological need in our main analyses, as our objectives were primarily focused on the role of students' global perceptions of the need-nurturing conditions within the educational climate (see the online supplements).

profiles should always be based on the theoretical and heuristic meaning of these solutions, and not only on the information criteria. Finally, we also report the entropy, which provides useful information on the accuracy with which participants are classified into the profiles (ranging from 0 to 1, with higher values suggesting a more accurate classification), although it should not be used to guide the selection of the optimal solution (Lubke & Muthén, 2007). After selecting the optimal LPA solution, we incorporated predictors to the model via a multinomial logistic regression link function and examined the statistical significance of outcomes differences across profiles using the multivariate delta method (Raykov & Marcoulides, 2004) implemented in Mplus with the MODEL CONSTRAINT function.

Results

Latent Profile Solution

The LPA was conducted using four indicators of psychological distress (global psychological distress, specific emotional exhaustion, specific generalized anxiety, and specific performance anxiety) as the specific factor of depression estimated as part of our preliminary analyses did not retain enough specificity once the variance explained by the global psychological distress factor was considered (see the online supplements). The results associated with the alternative LPA solutions estimated with these four indicators are reported in Table 1 and graphically presented (i.e., elbow plot) in Figure S1 of the online supplements. The CAIC, BIC, and ABIC kept on decreasing as the number of profiles increased while all BLRTs were statistically significant. In contrast, the elbow plot reveals a first plateau between the 3- and 4-profile solution, followed by a subsequent decrease which slightly starts to plateau again after the 6-profile solution. For these reasons, solutions including three to six profiles were more carefully examined. This examination revealed that adding a fourth and a fifth profile to the solution resulted in a meaningful addition to the model (as illustrated by the clear qualitative differences in shape between the five profiles illustrated in Figure 2) while adding a sixth profile simply resulted in the arbitrary division of existing profiles into smaller profiles with a similar, but more extreme, configuration. Therefore, the 5-profile solution was retained for further analyses, thus supporting Hypothesis 1a.

This 5-profile solution is illustrated in Figure 2, while detailed parameter estimates are reported in Tables S3 and S4 of the online supplements. Consistent with the moderately high entropy associated with this solution (.759), this model was associated with a relatively high classification accuracy (see Table S4: 82.2% to 88.6% across profiles). Profile 1 (*Low Distress*) corresponded to 8.75% of the students presenting with very low global levels of distress and very low specific levels of emotional exhaustion and performance anxiety, coupled with close to average specific levels of generalized anxiety. Profile 2 (*Emotionally Exhausted*) corresponded to 7.45% of the students presenting very high specific levels of emotional exhaustion combined with low global levels distress, average specific levels of generalized anxiety, and very low specific levels of performance anxiety. Profile 3 (*Performance Anxiety*) corresponded to 21.01% of the students presenting high levels of performance anxiety along with low global levels of distress, very low specific levels of emotional exhaustion, and close to average specific levels of generalized anxiety. Profile 4 (*General Distress*) corresponded to 28.74% of the students presenting very high global levels of distress coupled with average specific levels on all other indicators. Finally, Profile 5 (*Exhausted with Performance Anxiety*) was the largest (34.05%) and corresponded to students presenting high specific levels of emotional exhaustion and performance anxiety combined with close to average global levels of distress and specific levels of generalized anxiety. These five profiles were thus quantitatively and qualitatively distinct, thus supporting Hypothesis 1b.

Predictors of Profile Membership

The results from the predictive analyses are reported in Table 2 and are consistent with Hypotheses 2a and 2b. First, students who reported being exposed to a stronger need nurturing educational climate were more likely to belong to the *Low Distress* (1) and *Performance Anxiety* (3) profiles relative to the other profiles, as well as to the *Exhausted with Performance Anxiety* (5) profile relative to the *Emotionally Exhausted* (2) and *General Distress* (4) profiles. Second, students with a higher level of trait self-control were less likely to belong to the *General Distress* (4) profile relative to all other profiles. Importantly, these results were obtained while controlling for students' age, sex, residence status, parental education level, and immigration status, thus supporting Hypothesis 2c[3].

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[3]However, it is important to acknowledge that these results remain unchanged when sociodemographic characteristics were removed from the analysis.

Third, older students were more likely to belong to the *Low Distress* (1) profile relative to the *Emotionally Exhausted* (2), *General Distress* (4) and *Exhausted with Performance Anxiety* (5) profiles, as well as into the *Performance Anxiety* (3) profile relative to the *Emotionally Exhausted* (2) and *General Distress* (4) profiles. Fourth, men were more likely than women to belong to the *Low Distress* (1) and *Performance Anxiety* (3) profiles relative to the *General Distress* (4) and *Exhausted with Performance Anxiety* (5) profiles, as well as into the *Emotionally Exhausted* (2) profile relative to the *General Distress* (4) profile. Fifth, relative to students living with their parents, students not living with their parents were more likely to belong to the *General Distress* (4) profile relative to the *Low Distress* (1) and *Exhausted with Performance Anxiety* (5) profiles. Sixth, higher levels of parental education were associated with a higher likelihood of belonging to the *Performance Anxiety* (3) profile relative to the *Exhausted with Performance Anxiety* (5) profile. Finally, students whose parents were born outside of Canada were more likely to belong to the *General Distress* (4) profile relative to all other profiles, as well as to the *Performance Anxiety* (3) profile relative to the *Exhausted with Performance Anxiety* (5) profile.

Outcomes of Profile Membership

The results from the outcomes comparisons are presented in Table 3. Levels of suicidal ideation were higher in the *General Distress* (4) and *Exhausted with Performance Anxiety* (5) profiles (which did not differ from one another on this outcome) than in the *Low Distress* (1), *Emotionally Exhausted* (2), and *Performance Anxiety* (3) profiles (which also did not differ from one another). Levels of alcohol use were higher in the *Exhausted with Performance Anxiety* (5) profile than in all other profiles, which did not differ from one another on this outcome. Levels of cannabis use where the highest in the *Exhausted with Performance Anxiety* (5) profile, followed by both the *Low Distress* (1) and *General Distress* (4) profile, and were equally at their lowest in the *Performance Anxiety* (3) and *Emotionally Exhausted* (2) profiles, although this latter profile did not differ significantly from the *General Distress* (4) profile on this outcome. Levels of fast-food consumption were the lowest in the *Low Distress* (1) and *Performance Anxiety* (3) profile and were equally at their highest in the *General Distress* (4) and *Exhausted with Performance Anxiety* (5) profiles, although this latter profile did not differ significantly from the *Low Distress* (1) profile. The *Emotionally Exhausted* (2) profile did not differ from any of the other profiles on this outcome. Lastly, sedentary time was equally highest in the *Emotionally Exhausted* (2) and *General Distress* (4) profiles, followed equally by the *Performance Anxiety* (3) and *Exhausted with Performance Anxiety* (5) profiles, and lowest in the *Low Distress* (1) profile. Showing that the two profiles with the highest global levels of psychological distress (4-*General Distress* and 5-*Exhausted with Performance Anxiety*) had worst outcomes than the other profiles, these results are consistent with Hypotheses 3a and 3b.

Discussion

An important proportion of university students are likely to experience some level of psychological distress at one point or another over the course of their studies (Auerbach et al., 2018; Sharp & Theiler, 2018; Stallman, 2019). Moreover, this proportion has been found to increase in the aftermath of the COVID-19 pandemic (Hamza et al., 2021; Ghazawy et. al., 2021; Li et al., 2021). Yet, very little is known about the typical configurations of psychological distress manifestations commonly observed among this population. To address this shortcoming, this study sought to document the nature of students' psychological distress profiles at the beginning of the COVID-19 pandemic (Fall 2020) while relying on a proper disaggregation of their global levels of distress from their unique levels of depression (which was finally excluded from the analyses as it retained no specificity), emotional exhaustion, generalized anxiety, and performance anxiety. To identify some of the mechanisms likely involved in the emergence of these profiles, with the goal of guiding intervention, we also assessed how students' perceptions of the need-nurturing climate of their educational programs and their levels of trait self-control predicted their likelihood of membership into these profiles. Finally, to better understand the relevance of these profiles, we investigated their associations with students' suicidal ideation and adoption of a variety of risk behaviors. This approach allowed us to draw a nuanced and realistic portrait of university students' psychological distress profiles, their determinants, and their outcomes during the COVID-19 pandemic.

Psychological Distress Profiles

In line with Hypotheses 1a and 1b, our results revealed five qualitatively distinct profiles of psychological distress among our sample of students. First, we identified a small *Low Distress* profile characterized by very low levels across all indicators combined with average levels of generalized

anxiety. Unfortunately, this profile only included 8.75% of our sample, meaning that it did not represent the mental state of many students. In contrast, the remaining 91.25% of the students corresponded to one of the remaining four profiles, each characterized by a distinctive configuration of psychological distress manifestations. The second profile, labeled *Emotional Exhaustion*, was the smallest (7.45%) and included students who mainly experienced severe manifestations of emotional exhaustion along with low levels of global distress, very low levels of performance anxiety, and average levels of generalized anxiety. The third profile (*Performance Anxiety*) was more frequent and represented 21.01% of our participants who mainly experienced severe manifestations of performance anxiety and average levels of generalized anxiety. These students, however, did not feel emotionally exhausted and were not dealing with high levels of global distress. The fourth profile (*General Distress*) was also frequent and included 28.74% of our participants who experienced very high general levels of distress across all types of manifestations (as shown by the global distress indicator) combined with average levels on all specific indicators of distress. Lastly, our largest profile (*Exhausted with Performance Anxiety*) represented 34.05% of our participants who experienced high levels of emotional exhaustion and performance anxiety along with average levels on the global distress and generalized anxiety indicators.

From a theoretical perspective, these results indicate that most university students experienced some form of psychological distress during the COVID-19 pandemic. Although this is strongly aligned with previous variable-centered research conducted with this population during the pandemic (e.g., Browning et al., 2021; Hamza et al., 2021; Ghazawy et. al., 2021), it also clearly demonstrates substantial heterogeneity in the severity and configurations of psychological distress manifestations. Our results thus highlight the phenomenological complexity of students' psychological distress, and the importance of recognizing that not all students experience distress in the same way. From a methodological perspective, these results show the heuristic value of adopting a more precise operationalization of psychological distress that considers commonalities among all manifestations of psychological distress (i.e., the global distress factor) while also capturing their unique nature (i.e., the specific factors) when estimating profiles. Indeed, this approach allowed us to properly disentangle qualitative differences between profiles that might have remained conflated using more classical methods (Morin & Marsh, 2015; Morin et al., 2016b, 2017), as it has been the case in previous person-centered studies on student psychological distress (Browning et al., 2021; Hurlocker et al., 2022). More precisely, students' global levels of psychological distress were a core defining characteristic of all profiles in which it was the indicator showing either the strongest (i.e., *General Distress*), weakest (*Exhausted with Performance Anxiety*) or second weakest (*Low Distress*, *Performance Anxiety*, and *Emotionally Exhausted*) level. Similarly, the specific emotional exhaustion and performance anxiety factors (i.e., the two factors reflecting academic-related manifestations of psychological distress) played a crucial role in defining four of the profiles, being either the strongest or weakest score in all these profiles. Interestingly, no profile was dominated by high or low levels of generalized anxiety. This suggests that the identified profiles of students, whether living with psychological distress or not, did not tend to differ in their specific levels of generalized anxiety beyond the generalized levels of anxiety already captured by the global factor. Overall, in showing that some profiles were strongly driven by the global factor, while others were mainly driven by one or more specific factors, our results suggest that a complete typology of psychological distress among university students must include both types of indicators.

Predictors of Psychological Distress Profiles

One important goal of this study was to identify factors potentially associated with the likelihood of belonging to each profile. In line with SDT (Vansteenkiste et al., 2020) and supporting Hypothesis 2a, we found that students who felt exposed to an educational climate providing them with high levels of need-nurturing conditions during the COVID-19 pandemic were more likely to belong to the *Low Distress* (1) profile relative to most other profiles (with the sole exception of the 3-*Performance Anxiety* profile). This result matches previous research demonstrating that exposure to an educational climate that helps nurture students' basic psychological needs for autonomy, relatedness, and competence helps to prevent the emergence of various forms of psychological distress (Gilbert et al., 2021, 2022), save perhaps specific manifestations of performance anxiety. In this regard, for students who experienced some levels of psychological distress (i.e., not members of the *Low Distress* profile), perceived exposure to a need-nurturing climate increased their likelihood of belonging to the *Performance Anxiety* (3) profile relative to the *Emotionally Exhausted* (2), *General Distress* (4) and

Exhausted with Performance Anxiety (5) profiles. This is interesting given that the *Performance Anxiety* (3) profile displays the lowest levels of emotional exhaustion and the second-lowest global levels of psychological distress (coming right after the *Low Distress* profile). In other words, these results suggest that the *Low Distress* (1) and *Performance Anxiety* (3) profiles reflect the least maladaptive configurations of psychological distress manifestations. This in turn confirms our expectation that a need-nurturing climate seems related to lower levels of psychological distress generally, even if specific manifestations of performance anxiety may still emerge within this climate.

In line with this interpretation, perceptions of a nurturing educational climate also predicted a higher likelihood of belonging to the profile with the second-highest levels of performance anxiety, the *Exhausted with Performance Anxiety* (5) profile, relative to the *Emotionally Exhausted* (2) and *General Distress* (4) profiles. These results therefore suggest that supporting students' need satisfaction at a more general level (i.e., educational climate) may not necessarily offset their tendency to experience specific manifestations of performance anxiety but can contribute to limit their generalized experience of psychological distress and, to some extent, their experience of emotional exhaustion. In relation to performance anxiety, students enrolled in a program that offers them conditions they see as optimal for nurturing their needs for autonomy, competence, and relatedness might come to develop high expectations and standards for their own performance in that program. It would be interesting to further investigate the association between need support and performance anxiety in a more normative context (i.e., outside of the COVID-19 pandemic), while also considering other variables that could potentially explain this association (e.g., perfectionism; Herrera et al., 2021). In any case, the generalized effects of a need-nurturing educational climate on reducing the likelihood of experiencing high levels of psychological distress suggest that climate-building interventions might be potentially useful in preventing psychological distress, even if add-on components should be planned to limit the emergence of performance anxiety.

Partially supporting Hypothesis 2b, trait self-control was systematically associated with a lower likelihood of belonging to the *General distress* (4) profile relative to all other profiles. However, it had no effects on students' likelihood of experiencing these other profiles relative to each other. This means that a greater capacity for self-control was particularly important to prevent the experience of high levels of global distress in the context of the COVID-19 pandemic but did not substantially contribute to differentiating students based on specific manifestations of distress. These results are fully consistent with previous research on the P-factor. Indeed, studies have shown that individuals scoring high on this factor exhibit significant self-control deficits, suggesting that poor self-control is strongly involved in the propensity of experiencing persistent and severe psychiatric problems (which are reflected by a high score on the P-factor; Caspi et al., 2014). Our results thus suggest that students with poor self-control were at greater risks of experiencing more severe forms of psychological distress during the COVID-19 pandemic (i.e., belonging to the 4-*General distress* profile). A possible explanation is that self-control can lead to greater self-awareness, which in turn can contribute to the development and maintenance of autonomous types of academic motivation even when facing unfavorable learning conditions such as those imposed by the pandemic (Gilbert et al., 2023; Holding et al., 2019). Autonomous motivation is known to promote students' psychological well-being and protect them against psychological distress (Deci & Ryan, 2008; Ryan & Deci, 2020). Overall, these results are consistent with many variable-centered studies that have found that high levels of self-control help protect students against psychological distress (Gilbert et al., 2022; Morrison & Pidgeon, 2017; Powers et al., 2020), and imply that intervention targeting students' self-control could be a promising approach to reduce psychological distress (Canby et al., 2015).

Finally, and supporting Hypothesis 2c, the results described above were obtained while controlling for students' sociodemographic characteristics, namely their age, sex, residence status, parental education level, and immigration status. The results pertaining to those characteristics matched those obtained in previous variable-centered studies (conducted before and during the COVID-19 pandemic) by showing that men and older students were more likely to display a profile characterized by less maladaptive configurations of psychological distress (i.e., belong to the *Low Distress* or *Performance Anxiety* profile relative to many other profiles) (Al-Tammemi et al., 2021; Van de Velde et al., 2010; Velten et al., 2018) while students living on campus or in an apartment and those whose parents were born outside of Canada were more likely to experience higher global levels of psychological distress (i.e., belong to the *General Distress* profile relative to many other profiles) (Cadenas & Nienhusser, 2021; Husky et al., 2020; Sheldon et al., 2021). Finally, higher levels of

parental education were associated with a higher likelihood of belonging to the *Performance Anxiety* (3) profile relative to the *Exhausted with Performance Anxiety* (5) profile, suggesting that students whose parents are more educated tend to experience performance anxiety without necessarily feeling emotionally worn-out by their studies. This interesting result could arise from the fact that non-graduate parents tend to put more pressure on their children to succeed, which could in turn increase the risk of academic burnout (Sangma et al., 2018). Overall, these results are important because they show that students are not equally likely to experience the same psychological distress profiles as a result of their sociodemographic characteristics, meaning that these characteristics can help identify students most likely to fall into maladaptive psychological distress profiles.

Outcomes of Psychological Distress Profiles

Generally supporting Hypotheses 3a and 3b, the outcomes provided clear support for the importance of students' global levels of psychological distress. Indeed, less desirable outcome levels (i.e., higher suicidal ideation, greater alcohol and cannabis use, greater consumption of fast food, and more sedentary time) were generally associated with the *General Distress* (4) and/or *Exhausted with Performance Anxiety* (5) profiles, which presented the highest and second highest (albeit close to average in this second situation) levels on the global distress indicator. Beyond the importance of this global indicator, these results also highlighted the consequences related to a combination of high emotional exhaustion and performance anxiety (Profile 5) which are two indicators of psychological distress that are specific to the academic domain. Although this overall pattern of results is in line with previous research on the associations between psychological distress and health behaviors in university students (Sharp & Theiler, 2018), this study goes a step further by showing which configurations of distress manifestations (i.e., high levels of global distress or high levels of emotional exhaustion and performance anxiety) make students more at risk of experiencing suicidal ideation and risk behaviors. These results are important as these deleterious outcomes represent important threats to students' academic achievement and health (Ford et al., 2011; Whatnall et al., 2022). It is noteworthy that the *General Distress* (4) and *Exhausted with Performance Anxiety* (5) profiles included a total of 62.79% of the sample, thus suggesting that, at the time of data collection (COVID-19 pandemic), most undergraduate students might have been struggling with psychological health issues that were affecting multiple aspects of their academic and personal functioning and well-being.

Unexpectedly, we found no significant difference in terms of cannabis consumption between the *Low Distress* (1) and *General Distress* (4) profiles, which indicates that students belonging to these two profiles did not differ from one another in terms of cannabis use. This finding suggests that amid campus closures, some students may have turned to cannabis use solely for recreational purposes rather than to help them cope with high levels of distress. This tendency may have been reinforced by the fact that cannabis is legal in Canada, and therefore readily available. Although this finding is aligned with the general increase in cannabis use observed in university students after the onset of the COVID-19 pandemic (e.g., Firkey et al., 2021; Schepis et al., 2021), it shows that this use does not always occur in the context of psychological distress. This subgroup comparison fails to replicate previous variable-centered reports showing a general positive association between cannabis and distress (e.g., Chang et al., 2022). Relying on a person-centered approach thus allowed us to draw a more nuanced portrait of cannabis consumption among university students in times of COVID-19. **Implications for Practice and Research**

As noted in the previous sections, this study has several implications for practice and for research on university students' psychological distress. First, it is well recognized that mental health is heterogeneous across clinical and typical populations, with varying symptom configurations that have different causes and lead to different impairments in functioning (Allsopp et al., 2019; Feczko et al., 2019). Additionally, it has been established that some individuals are more at risk of simultaneously experiencing multiple types of mental health problems as evidenced by their propensity to report high scores on the P-factor (Caspi et al., 2014). This heterogeneity implies that one type of intervention may be more effective for some members of a specific population than others, and that some individuals may require even higher levels of support due to the severity and/or multiplicity of their difficulties. Thus, identifying subpopulations of students characterized by different psychological distress configurations, as we did in this study, appears to be an important prerequisite step to build targeted interventions because it provides important insights into the complex nature of students' mental health and its key determinants and consequences (Kusurkar et al., 2021). This is even more important in the context of the COVID-19 pandemic as such a macro-level crisis does not entail the same consequences

for everyone as a function of individual vulnerabilities (Xiong et al., 2020).

As we showed, membership to psychological distress profiles was significantly associated with deleterious outcomes and predicted by the quality of the program's educational climate and student's self-control. This sequence implies that students' psychological adjustment and optimal functioning are closely related to contextual and individual factors that, for the most part, are modifiable. This type of information could be used for prevention purposes by universities to guide the development of an educational climate that foster students' well-being (through BPN satisfaction) and to target students most at risk of belonging to maladaptive profiles, such as those displaying low self-control. These preventive interventions should potentially be implemented right from the start of the educational program, which has been previously reported to represent a critical period for the emergence of psychological distress (Bewick et al., 2010). These interventions could also benefit from adopting a targeted perspective, tailored to the specific needs of certain groups of students in order to act on their own unique psychological distress profiles and associated consequences (e.g., suicidal ideation, risk behaviors, and issues related to learning and academic performance). In times when universities are facing increasing demands for care that exceed the capacities of the traditional counseling center model (Abrams, 2022), adopting a person-centered perspective focused on psychological distress profiles could potentially help these institutions allocate their resources and support services more effectively. However, it is important to emphasize that person-centered research relies on replication (across time and samples) to ensure consistency in terms of the number and nature of identified profiles (Morin et al., 2018). Therefore, instead of focusing on the general prevalence of psychological distress manifestations in university students, as has been widely done over the past two decades (see Gao et al., 2020; Rosales-Ricardo et al., 2021; Sheldon et al., 2021), we believe that researchers should start focusing more extensively on identifying and replicating the most occurring profiles of psychological distress among this population.

Strengths, Limitations, and Future Directions

This study contributed to research on university students' psychological distress by adopting a person-centered approach, which has rarely been used in previous investigations. Psychological distress profiles were also estimated based on a proper disaggregation of global and specific levels of distress, and the construct validity of these profiles was tested by considering a range of theoretically relevant predictors and outcomes while also considering multiple sociodemographic characteristics. However, this study also presents limitations that should be taken into consideration when interpreting our findings. First, this study relied completely on self-report measures, which are known to be prone to social desirability and self-evaluation biases. Future research could rely on a multi-informant approach involving informants (e.g., parents, clinicians) who vary in the contexts in which they observe students to obtain a more robust portrait of their psychological distress. Second, we adopted a cross-sectional design that precludes causal inferences and makes it impossible to assess the directionality of the associations between predictors, profile membership, and outcomes. This design also makes it impossible to assess the stability of the obtained profiles across time. Future longitudinal research including multiple time points could allow to examine the consistency and stability of psychological distress profiles across time. Third, this study was conducted during the COVID-19 pandemic, which also limits the generalizability of our results. Indeed, the pandemic has disrupted higher education, especially by forcing the transition to distance learning because of confinement-related procedures. As many components of the present study are new, further research will be needed to determine whether the profiles obtained in this study, their prevalence, and their associations with predictors and outcomes can be generalized to a more normative educational context. Moreover, it might be interesting to test whether our results would generalize when additional indicators of psychological distress (e.g., stress, loneliness), as well as a fuller representation of academic burnout (i.e., including cynicism and feelings of inadequacy in addition to emotional exhaustion) were considered. Furthermore, having only limited guidance related to the expected shape of our profiles, our predictors and outcomes were selected based on their relevance to the study of psychological distress in general. Now that we know a bit more about the nature of these profiles, further research should attempt to expand our results based on the consideration of predictors and outcomes more closely relevant to each profile unique configuration of distress manifestations. Lastly, our sample included mostly women (roughly 80%), which report higher levels of psychological distress than males, as well as students who were on the average slightly older than expected for second-year university students (roughly 22 years old). This impairs the generalizability of our results to the whole population of university students. More generally, the

generalizability of our results to other countries, cultures, and educational levels should also be investigated in future research.

Conclusion

Our study revealed five profiles of students characterized by different configurations of global and specific levels of psychological distress. The profile displaying high global levels of distress and the one characterized by a combination of specific emotional exhaustion and performance anxiety were associated with more suicidal ideation, alcohol and cannabis use, fast-food consumption, and sedentary time. More importantly, we showed that membership to the identified profiles was predicted by modifiable factors, namely the educational climate and student self-control. These factors should thus be considered in evidence-based interventions aiming at fostering university students' psychological and physical well-being. In turn, our results should help prioritize resource allocation and contribute to the development of targeted interventions among higher education institutions.

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Figure 1

Graphical Representation of the Model of Psychological Distress Used in this Study
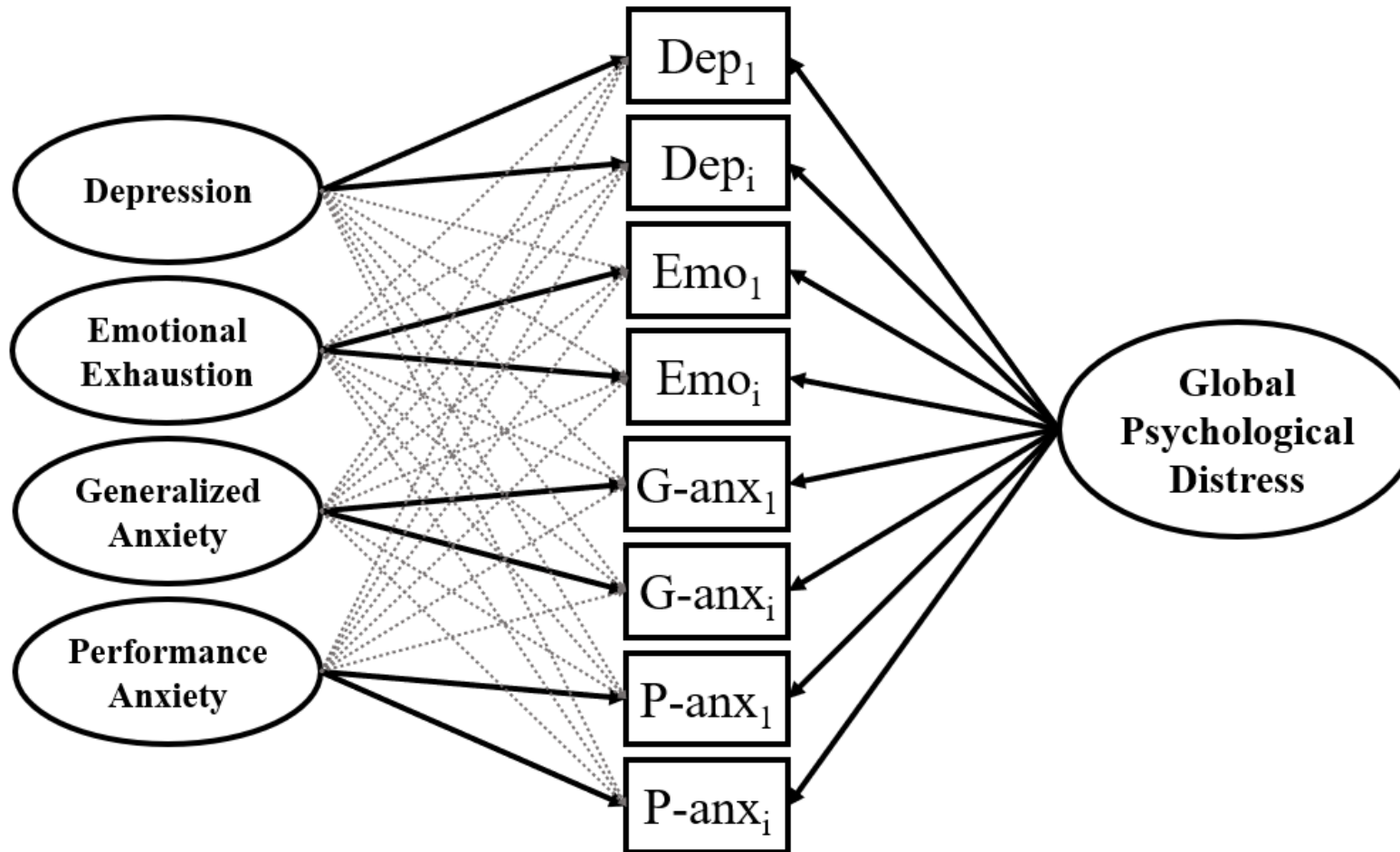
Note. Ovals represent latent factors while rectangles represent items. Full arrows represent target loadings while dashed arrows represent cross-loadings. Dep = Depression; Emo = Emotional exhaustion; G-anx = Generalized anxiety; P-anx = Performance anxiety. i = other items of each scale.

Figure 2
Final 5-Profile solution
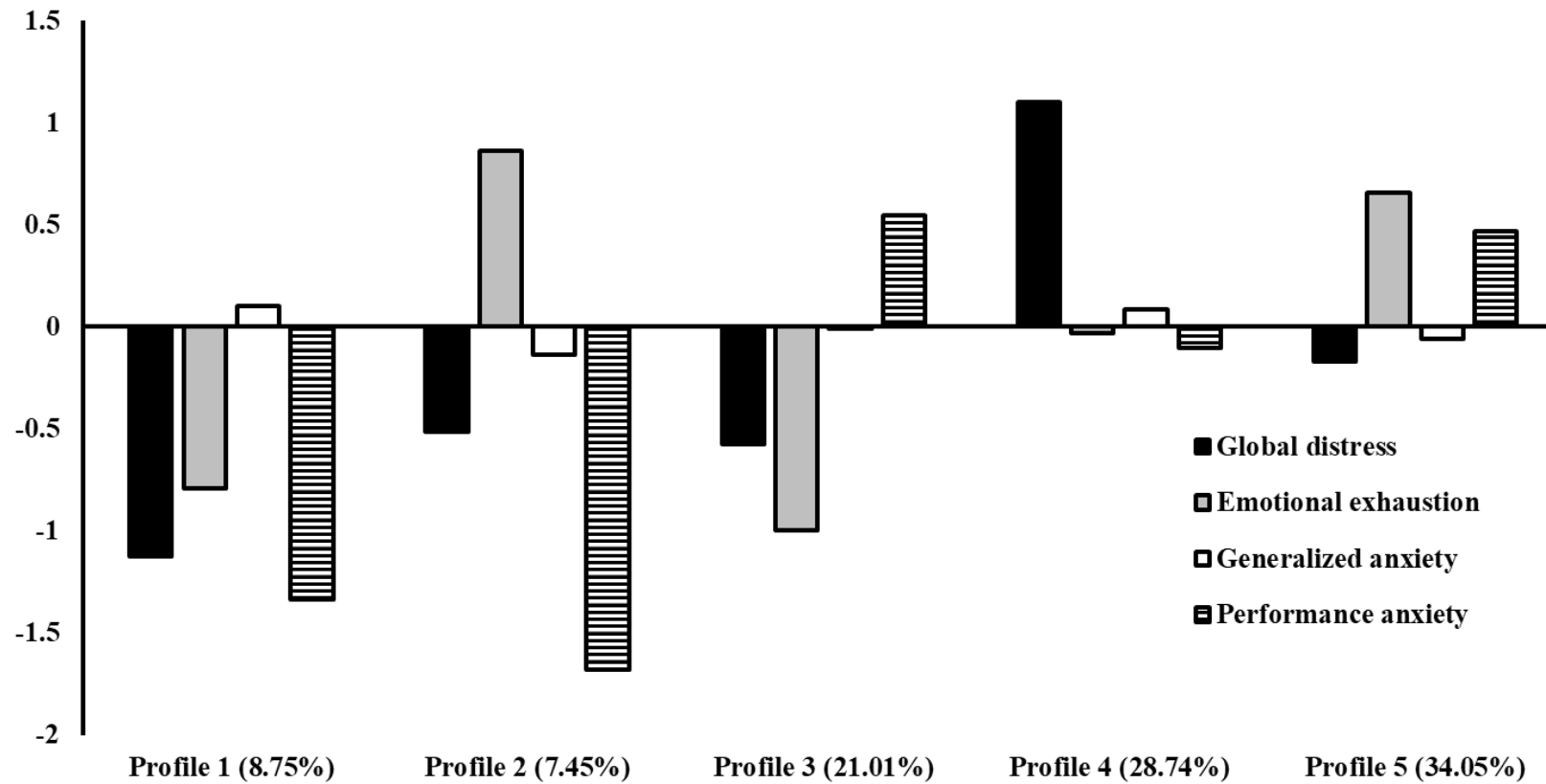
Note. Profile indicators were standardized factor scores (M = 0, SD = 1) derived from preliminary measurement models; Profile 1: *Low Distress*; Profile 2: *Emotionally Exhausted*; Profile 3: *Performance Anxiety*; Profile 4: *General Distress*; Profile 5: *Exhausted with Performance Anxiety*.

Table 1

Model Fit Results from the Latent Profile Analyses

Model	LL	#fp	Scaling	AIC	CAIC	BIC	ABIC	Entropy	aLMR	BLRT
1 profile	-4424.223	8	.996	8864.446	891.218	8902.218	8876.813	-	-	-
2 profiles	-4339.343	13	.963	8704.685	8779.064	8766.064	8724.781	.862	< .001	< .001
3 profiles	-4265.611	18	1.055	8567.222	8670.208	8652.208	8595.046	.744	< .001	< .001
4 profiles	-4238.506	23	1.089	8523.013	8654.605	8631.605	8558.566	.728	< .050	< .001
5 profiles	-4199.318	28	1.141	8454.635	8614.835	8586.835	8497.917	.759	< .050	< .001
6 profiles	-4164.101	33	1.178	8394.201	8583.008	8550.008	8445.212	.806	.061	< .001
7 profiles	-4137.354	38	1.144	8350.708	8568.122	8530.122	8409.448	.817	< .050	< .001
8 profiles	-4110.376	40	1.125	8306.752	8549.773	8509.773	8373.220	.809	< .010	< .001

Note. LL: loglikelihood; fp: number of free parameters; AIC: Akaike information criterion; CAIC: constant AIC; BIC: Bayesian information criterion; ABIC: sample-size adjusted BIC; aLMR: p-value associated with the adjusted Lo-Mendell-Rubin likelihood ratio test; BLRT: Bootstrap likelihood ratio test.

Table 2

Results from Multinomial Logistic Regressions for the Effects of the Predictors on Profile Membership

Predictors	Profile 1 vs Profile 2 Coeff.(SE)	OR	Profile 1 vs Profile 3 Coeff.(SE)	OR	Profile 1 vs Profile 4 Coeff.(SE)	OR	Profile 1 vs Profile 5 Coeff.(SE)	OR	Profile 2 vs Profile 3 Coeff.(SE)	OR
Educational climate	1.477(.285)**	4.379	.046(.216)	1.047	1.759(.235)**	5.806	1.046(.203)**	2.847	-1.431(.246)**	.239
Trait self-control	.386(.279)	1.471	.274(.214)	1.315	1.404(.240)**	4.071	.259(.208)	1.296	-.112(.216)	.894
Age (standardized)	.695(.205)**	2.004	.141(.130)	1.152	.495(.171)**	1.641	.332(.127)*	1.394	-.554(.193)**	.575
Sex (being a male)	.684(.510)	1.981	.567(.377)	1.763	1.686(.449)**	5.397	1.398(.363)**	4.047	-.117(.427)	.890
Residence (not parents)	-.892(.486)	.410	-.392(.358)	.676	-.979(.384)*	.376	-.230(.343)	.795	.501(.400)	1.650
Parental education	-.099(.210)	.906	-.152(.150)	.859	.047(.155)	1.048	.088(.135)	1.092	-.053(.184)	.949
Immigration status	-.206(.642)	.814	-.240(.485)	.786	-1.267(.521)*	.282	.628(.530)	1.873	-.034(.513)	.967

Predictors	Profile 2 vs Profile 4 Coeff.(SE)	OR	Profile 2 vs Profile 5 Coeff.(SE)	OR	Profile 3 vs Profile 4 Coeff.(SE)	OR	Profile 3 vs Profile 5 Coeff.(SE)	OR	Profile 4 vs Profile 5 Coeff.(SE)	OR
Educational climate	.282(.213)	1.326	-.431(.210)*	.650	1.713(.197)**	5.547	1.000(.159)**	2.719	-.713(.155)**	.490
Trait self-control	1.018(.222)**	2.768	-.127(.202)	.881	1.130(.171)**	3.096	-.015(.142)	.985	-1.145(.151)**	.318
Age (standardized)	-.200(.178)	.819	-.363(.187)	.696	.354(.157)*	1.424	.191(.123)	1.210	-.163(.160)	.850
Sex (being a male)	1.002(.425)*	2.725	.714(.409)	2.043	1.119(.377)**	3.062	.831(.309)*	2.296	-.288(.366)	.750
Residence (not parents)	-.087(.385)	.917	.663(.371)	1.940	-.588(.307)	.556	.162(.266)	1.176	.750(.273)*	2.116
Parental education	.146(.164)	1.157	.187(.170)	1.205	.199(.133)	1.220	.239(.118)*	1.270	.041(.110)	1.041
Immigration status	-1.060(.507)*	.346	.834(.549)	2.302	-1.026(.369)*	.358	.868(.425)*	2.382	1.894(.442)**	6.648

Note. * $p < .05$; ** $p < .01$; OR = odds ratio; The coefficients and OR reflects the effects of the predictors on the likelihood of membership into the first listed profile relative to the second listed profile; Profile 1: *Low Distress*; Profile 2: *Emotionally Exhausted*; Profile 3: *Performance Anxiety*; Profile 4: *General Distress*; Profile 5: *Exhausted with Performance Anxiety*; Educational climate and trait self-control are standardized factor scores ($M = 0$, $SD = 1$); Sex: 0 = female, 1 = male; Residence: 0 = living with parents, 1 = living elsewhere; Parental education level: 0 = primary school to 6 = master/doctoral degree; Immigration status: 0 = parents born in Canada, 1 = parents born outside of Canada.

Table 3

Associations Between Profile Membership and Outcomes

	Profile 1 Mean [CI]	Profile 2 Mean [CI]	Profile 3 Mean [CI]	Profile 4 Mean [CI]	Profile 5 Mean [CI]	Summary of Significant Differences
Suicidal ideation (0 to 4)	.089 [.025; .152]	.078 [.040; .116]	.077 [.045; .108]	.473 [.384; .561]	.375 [.149;0.602]	1 = 2 = 3 < 4 = 5
Alcohol (0 to 3)	1.150 [.908; 1.393]	.999 [.792; 1.206]	1.138 [1.018; 1.258]	1.118 [1.015; 1.221]	1.845 [1.618; 2.072]	1 = 2 = 3 = 4 < 5
Cannabis (0 to 3)	.171 [.075; .267]	.054 [.003; .106]	.048 [.004; .091]	.116 [.069; .163]	2.091 [1.504; 2.679]	3 < 1 = 4 < 5; 2 = 3 < 1 < 5; 2 = 4
Fast-food (0 to 3)	1.019 [.833; 1.204]	1.129 [.967; 1.291]	.966 [.869; 1.063]	1.301 [1.214; 1.388]	1.220 [1.022; 1.417]	3 < 4 = 5; 1 < 4; 1 = 2 = 3; 2 = 4 = 5; 1 = 5
Sedentary time (1 to 4)	2.154 [1.933; 2.375]	2.904 [2.647; 3.160]	2.558 [2.435; 2.680]	2.892 [2.794; 2.989]	2.547 [2.335; 2.759]	1 < 3 = 5 < 2 = 4

Note. CI = 95% Confidence Interval. Profile 1: *Low Distress*; Profile 2: *Emotionally Exhausted*; Profile 3: *Performance Anxiety*; Profile 4: *General Distress*; Profile 5: *Exhausted with Performance Anxiety*.

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Results of the Preliminary Analyses

The preliminary analyses were conducted using the maximum likelihood robust (MLR) estimator implemented in Mplus 8.8 (Muthen & Muthen, 2022). The goodness-of fit of all models was evaluated using recommended goodness of fit indices (Hu & Bentler, 1999; Marsh et al., 2005): The comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA). Adequate and excellent model fit are respectively indicated by CFI and TLI >.90 and .95, and by RMSEA values < .08 and .06.

The bifactor-ESEM solution used to represent students' ratings of psychological distress resulted in an acceptable level of fit to the data (χ^2 = 1050.884, df = 271, p < .01; CFI = .946; TLI = .919; RMSEA = .059). The parameter estimates from this model are reported in Table S1, and reveal a well-defined and reliable global psychological distress factor (λ = .449 to .792; M_λ = .630; ω = .966), accompanied by well-defined and reliable emotional exhaustion (λ = .030 to .653; M_λ = .418; ω = .813), generalized anxiety (λ = .176 to .573; M_λ = .388; ω = .737), and performance anxiety (λ = .324 to .745; M_λ = .587; ω = .799) specific factors. However, once the variance explained by the global psychological distress factor was considered, very little specificity remained associated with the specific depression factor (λ = -.166 to .428; M_λ = .151; ω = .400). This means that among our sample, responses provided to depression items mainly served to define students' global levels of psychological distress (i.e., the global factor) with no remaining specificity. This specific factor was thus excluded from further analyses.

A single measurement model encompassing educational climate, trait self-control, and suicidal ideation was estimated. In this model, one a priori correlated uniqueness was added to this model to account for the parallel wording of two items from the trait self-control measure, which both referred to "things that are bad for me" (Morin et al., 2020). This model resulted in an acceptable level of fit to the data (χ^2 = 1444.259, df = 601, p < .01; CFI = .938; TLI = .920; RMSEA = .039). The results from this model are reported in Table S2 and reveal well-defined trait self-control (λ = .499 to .843; M_λ = .546; ω = .848), suicidal ideation (λ = .813 to .905; M_λ = .860; ω = .900), and global educational climate (λ = .472 to .705; M_λ = .597; ω = .947) factors. As expected, the items reflecting need support loaded positively on the global educational climate factor (Autonomy: λ = .599 to .648; M_λ = .623; Competence: λ = .619 to .702, M_λ = .650; Relatedness: λ = .472 to .570, M_λ = .518), whereas the need thwarting items loaded negatively on this global factor (Autonomy: λ = -.545 to -.684, M_λ = -.628; Competence: λ = -.532 to -.705, M_λ = -.628; Relatedness: λ = -.464 to -.580, M_λ = -.534). Although the specific educational climate factors also retained some levels of specificity, these specific factors were not retained for our analyses given that our goal to primarily consider the role played by students' global perceptions of the need-nurturing nature of their educational climate. Moreover, this global factor also provides a much more parsimonious operationalization of the educational climate than the joint consideration of all specific facets covered in this instrument. Factor scores (standardized units; M = 0, SD = 1) were saved from these models and used as inputs in the main analyses (for a discussion of the advantages of factor scores, see Morin et al., 2016).

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Figure S1

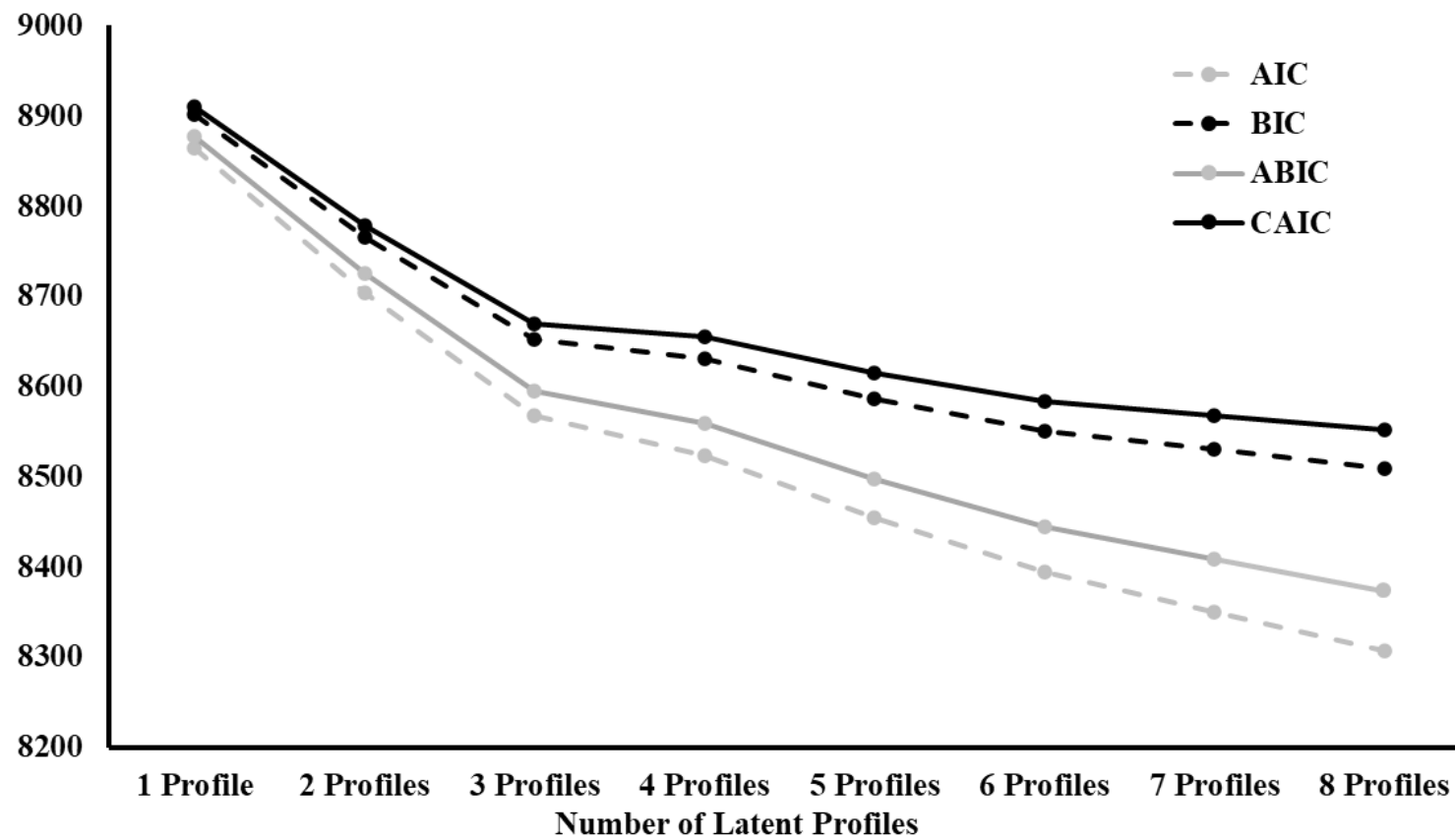*Elbow Plot Associated with the Latent Profile Analyses*

Table S1

Standardized Parameter Estimates from the Bifactor-ESEM Measurement Model of Psychological Distress

	Global distress (λ)	Depression (λ)	Emotional exhaustion (λ)	Generalized anxiety (λ)	Performance anxiety (λ)	δ
Depression						
Dep1	**.731****	**.127**	.035	-.142**	-.087**	.421
Dep2	**.792****	**.114**	.006	-.024	-.098**	.350
Dep3	**.620****	**.428****	-.001	.085*	-.001	.426
Dep4	**.672****	**.397****	.106**	-.030	.000	.378
Dep5	**.614****	**.292****	-.030	-.007	-.017	.536
Dep6	**.757****	**.005**	-.091**	-.032	.080**	.411
Dep7	**.651****	**.171***	.038	-.012	-.020	.545
Dep8	**.569****	**-.012**	-.055	.002	-.144**	.653
Dep9	**.505****	**-.166**	-.144**	-.097*	-.103**	.677
ω		.400				
Emotional exhaustion						
Emo1	**.747****	.078	**.484****	-.013	.007	.202
Emo2	**.620****	.148**	**.606****	.032	.088**	.217
Emo3	**.672****	.133**	**.511****	-.005	.036	.269
Emo4	**.566****	-.091	**.212****	.013	-.048	.624
Emo5	**.668****	.040	**.653****	.020	.023	.125
Emo6	**.710****	-.093	**.397****	-.127**	-.015	.314
Emo7	**.503****	-.127*	**.509****	.068	.044	.465
Emo8	**.449****	-.164*	**.030**	.060	-.042	.765
Emo9	**.784****	-.077	**.357****	.012	-.002	.251
ω			.813			
Generalized anxiety						
G-anx1	**.664****	.089*	.116**	**.446****	.130**	.321
G-anx2	**.723****	.026	.021	**.522****	.096**	.195
G-anx3	**.714****	-.046	-.024	**.573****	.044*	.157
G-anx4	**.678****	.084*	.063*	**.424****	.063*	.346
G-anx5	**.594****	-.031	-.051	**.278****	-.080*	.560
G-anx6	**.647****	.010	-.037	**.176****	.010	.548
G-anx7	**.612****	-.137**	-.128**	**.297****	-.020	.502
ω				.737		
Performance anxiety						
P-anx1	**.449****	-.024	.021	.010	**.745****	.242
P-anx2	**.533****	-.098*	-.01	-.041	**.674****	.250
P-anx3	**.557****	.160*	.035	.213**	**.324****	.513
P-anx4	**.465****	.033	.123**	.141**	**.604****	.383
ω	.966				.799	

Note. * $p < .05$; ** $p < .01$; λ: Factor loading; δ: Item uniqueness; ω: model-based omega composite reliability based on McDonald (1970); Target factor loadings are in bold.

Table S2

Standardized Parameter Estimates from the Measurement Model of Educational Climate, Trait Self-Control, and Suicidal Ideation

	GNN (λ)	AS (λ)	CS (λ)	RS (λ)	AT (λ)	CT (λ)	RT (λ)	δ
AS1	**.599****	**.481****	.131*	-.064	.091*	.137**	.165**	.334
AS2	**.648****	**-.157**	-.034	.006	-.012	.205**	.118**	.498
AS3	**.628****	**.123***	.117*	.126**	-.017	-.053	.040	.557
AS4	**.616****	**.324****	.125**	.065*	-.027	.056	.144**	.471
ω		.665						
CS1	**.702****	.400**	**.203****	-.070*	.158**	.001	.169**	.248
CS2	**.619****	-.056	**.520****	.029	.037	-.016	.079*	.335
CS3	**.651****	-.013	**.561****	.074*	-.023	-.053	.081**	.246
CS4	**.627****	.249**	**.314****	-.044	.100*	-.062	.105**	.420
ω			.672					
RS1	**.570****	.037	-.028	**.452****	.065*	.010	.133**	.446
RS2	**.537****	-.030	.029	**.622****	.061*	-.003	.046	.317
RS3	**.493****	-.015	.039	**.494****	.025	.018	.000	.510
RS4	**.472****	.050	.014	**.292****	.056	.071	-.075*	.675
ω				.640				
AT1	**.545****	.020	.014	.070*	**.572****	.011	-.043	.368
AT2	**.677****	.112**	.087*	.092*	**.254****	.034	.095**	.438
AT3	**.684****	.323**	.288**	.248**	**.071**	-.072	-.057	.270
AT4	**.604****	-.045	.031	.024	**.630****	.075*	.029	.229
ω					.545			
CT1	**.697****	.100*	-.118**	.104**	.041	**.349****	.007	.356
CT2	**.579****	.009	.080	-.079**	.107*	**.189****	.213**	.560
CT3	**.705****	.013	-.041	.012	-.082*	**.328****	.169**	.357
CT4	**.532****	.017	-.066	.027	.187**	**.266****	-.027	.605
ω						.506		
RT1	**.545****	.046	.026	.031	-.024	.061	**.737****	.153
RT2	**.464****	.019	.064	.065**	-.014	-.094	**.700****	.277
RT3	**.547****	.135**	.052	.018	.111**	.018	**.557****	.357
RT4	**.580****	-.017	.107**	-.020	-.036	.183**	**.558****	.305
ω	.947						.856	

	TS-C (λ)							δ
TS-C1	**.440**							.807
TS-C2	**.442**							.805
TS-C3	**.692**							.521
TS-C4	**.397**							.843
TS-C5	**.601**							.639
TS-C6	**.707**							.499
TS-C7	**.409**							.833
TS-C8	**.542**							.706
TS-C9	**.682**							.535
TS-C10	**.573**							.672
TS-C11	**.562**							.684
TS-C12	**.572**							.673
TS-C13	**.473**							.776
ω	.848							

	SI (λ)							δ
SI1	**.863**							.256
SI2	**.813**							.339
SI3	**.905**							.182
ω	.900							

Note. * $p < .05$; ** $p < .01$; GNN = Global need nurturing; AS = Autonomy support; CS = Competence support; RS = Relatedness support; AS = Autonomy thwarting; CS = Competence thwarting; RS = Relatedness thwarting; TS-C = Trait self-control; SI = Suicidal ideation. λ: Factor loading; δ: Item uniqueness; ω: composite reliability (McDonald, 1970); Target factor loadings are in bold.

Table S3

Exact Within-Profile Means, Variances and 95% Confidence Intervals [95% CI] from the Five-Profile Solution

	Profile 1 Mean [95% CI]	Profile 2 Mean [95% CI]	Profile 3 Mean [95% CI]	Profile 4 Mean [95% CI]	Profile 5 Mean [95% CI]	Variance [95% CI]
Global distress	-1.128 [-1.310, -.946]	-.513 [-.724, -.301]	-.577 [-.724, -.431]	1.101 [.949, -1.254]	-.172 [-.354, .010]	.380 [.308, .452]
Emotional exhaustion	-.790 [-1.012, -.567]	.861 [.683, 1.039]	-.997 [-1.152, -.842]	-.034 [-.192, .123]	.659 [.564, .754]	.368 [.289, .446]
Generalized anxiety	.102 [-.081, .286]	-.140 [-.411, .131]	-.011 [-.179, .158]	.086 [-.049, .221]	-.061 [-.209, .087]	.768 [.681, .855]
Performance anxiety	-1.339 [-1.643, -1.034]	-1.683 [-1.947, -1.420]	.544 [.400, .688]	-.106 [-.209, -.003]	.466 [.355, .578]	.318 [.282, .355]

Note. Factors were estimated from factor scores with a mean of 0 and a standard deviation of 1; Profile 1: Low Distress; Profile 2: Emotionally Exhausted; Profile 3: Performance Anxiety; Profile 4: General Distress; Profile 5: Exhausted with Performance Anxiety.

Table S4

Classification Accuracy: Most Likely Latent Profile Membership (Row) by Latent Profile (Column)

	Profile 1	Profile 2	Profile 3	Profile 4	Profile 5
Profile 1	.886	.045	.055	.004	.010
Profile 2	.066	.846	.001	.032	.055
Profile 3	.045	.000	.837	.042	.076
Profile 4	.002	.007	.022	.858	.110
Profile 5	.005	.013	.060	.099	.822

Note. Profile 1: *Low Distress*; Profile 2: *Emotionally Exhausted*; Profile 3: *Performance Anxiety*; Profile 4: *General Distress*; Profile 5: *Exhausted with Performance Anxiety*.