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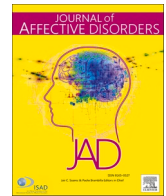
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Research paper

Post-pandemic student mental health and coping strategies: A time trajectory study

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ABSTRACT

Students are particularly vulnerable to lockdown-related problems associated with the COVID-19 pandemic. The present study aimed to investigate mental health (anxiety and depressive symptoms, and wellbeing) during the second year of the pandemic, after three lockdowns, in relation with coping strategies. For this, 380 students participated in a longitudinal study between June and December 2021. At three measurement points (T1: between June 7th and July 14th, 2021; T2: between October 12th and November 14th, 2021; and T3: between December 7th and 20th 2021), participants were asked to complete the same questionnaire measuring mental health and coping strategies for dealing with the pandemic. To highlight longitudinal profiles in coping, we estimate longitudinal cluster analyses. Our results show 5 profiles of students according to the coping strategies used to deal with the pandemic at the three collection times. Students who prefer to use avoidance are particularly vulnerable, while those using coping focused on positive thinking experience fewer anxiety and depressive symptoms and higher wellbeing.

1. Introduction

1.1. Consequences for students' mental health

During the COVID-19 pandemic, deterioration in mental health was highlighted (for meta-analyses, see [Necho et al., 2021](#)), particularly among students (for anxiety and depression, see meta-analyses by [Ebrahim et al., 2021](#); [Li et al., 2021](#); and systematic review by [Wu et al., 2023](#); for stress, see meta-analyses of [Fang et al., 2022](#)). More specifically, since the beginning of the COVID-19 pandemic, several studies have shown an increase in anxiety and depressive symptoms ([Charbonnier et al., 2021](#); [Essadek and Rabeyron, 2020](#); [Fernández-Castillo, 2021](#); [Husky et al., 2020](#); [Kaparounaki et al., 2020](#); [Le Vigouroux et al., 2021](#); [Zis et al., 2021](#)), and a decrease in psychological wellbeing ([Holm-Hadulla et al., 2021](#)).

However, it is important to note that although many studies were carried out among students during the COVID-19 pandemic, few took a longitudinal approach. The few longitudinal studies that have been carried out have shown an increase in anxiety and depressive symptoms during the first lockdown compared with before ([Fruehwirth et al., 2021](#); [Hasratian et al., 2021](#); [Li et al., 2020](#); [Van Zyl et al., 2021](#); [Votmer](#)

[et al., 2021](#)), and a decrease in wellbeing (for a systematic review, see [Lemyre et al., 2023](#)). More specifically, among the French student population, anxiety and depressive symptoms were higher during lockdown periods compared with unlock periods, and were even higher during the lockdown of the second year of the pandemic (spring 2021) compared with the first (spring 2020; [Charbonnier et al., 2021](#)). In sum, these data suggest that students' mental health appeared to be deteriorated both by lockdown and by the duration of the pandemic.

Even before the COVID-19 pandemic, context and time had already been identified as key factors for students' mental health. For example, it has been demonstrated that anxiety and depressive symptoms as well as wellbeing could increase, decrease or persist over the academic year ([Chevrier and Lannegrand, 2022a](#); [Crocetti et al., 2009](#); [Hirai et al., 2015](#); [Salmela-Aro et al., 2008](#)). These trajectories are related to academic (e.g., exam periods), personal (e.g., leaving the family home), or even global (e.g., daily tasks) events. Given that the COVID-19 pandemic is a major global event likely to have a long-term effect on students' mental health (e.g., [Zhang et al., 2021](#)), it seems essential to investigate its long-term consequences, while taking into account potential fluctuations linked to the academic year.

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1.2. Coping with the pandemic

Many factors can explain the deterioration in students' mental health during the COVID-19 pandemic and lockdown such as coping strategies to deal with the pandemic (e.g., Carnahan et al., 2022). Coping is the behavioral and cognitive efforts made by the individual to modify or maintain their state of stress and are used in dealing with daily stressors (Carver et al., 1989; Lazarus and Folkman, 1984). Coping is a multidimensional construct which has led to different categorizations. Baumstarck et al. (2017) argue that there are essentially four categories of strategies to cope with a singular stressful event (such as the pandemic): problem-solving, positive thinking, avoidance, and seeking social support. *Problem-solving* refers to efforts which focus on problem resolution such as trying to suppress or minimize the stressors (i.e., active coping) and planning. *Positive thinking* refers to humor, acceptance, and positive reframing. *Seeking social support* refers to focusing on one's emotions (i.e., venting), and to searching for various kinds of support: instrumental support (e.g., advice and assistance), emotional support (e.g., moral support and understanding), and religion. Lastly, *avoidance* refers to dropping out or giving up (i.e., behavioral disengagement), distracting oneself by engaging in various activities unrelated to the stressor (i.e., self-distraction), to self-blame, to denial, and to substance use. Coping strategies are more situation-dependent than personality-dependent (Stewart and Schwarzer, 1996). Nevertheless, some strategies are relatively stable over time, suggesting a trait-like character (e.g., seeking social support) while others are more likely to fluctuate (e.g., avoidance, through behavioral disengagement, denial; Nielsen and Knardahl, 2014), especially regarding the COVID-19 pandemic situation (e.g., problem-solving through active coping, positive thinking through acceptance, seeking social support through venting; Godor and Van Der Hallen, 2022).

In addition to fluctuations over time, it is also important to note that an individual may use more than one strategy at once to deal with a stressful situation (Sideridis, 2006). A person-oriented approach, defined as the identification of subgroups of participants characterized by distinct configurations of a set of interacting variables, allows different patterns to be studied and reflects the dynamic nature of the individual (Bergman and Andersson, 2010). Among the French student population, four profiles of strategies were highlighted before the COVID-19 pandemic (Doron et al., 2015): high copers (i.e., high scores in all strategies), adaptive copers (i.e., very high score in problem-solving, moderate score in positive thinking, low scores in avoidance and in seeking social support), avoidant copers (i.e., very low scores in problem-solving and positive thinking, high score in avoidance, and moderate score in seeking social support), and low copers (i.e., low in all strategies). Among Spanish students, three profiles were highlighted (Suriá Martínez and Ortigosa Quiles, 2022): cluster 1 – which could be called avoidant copers (i.e., high scores on avoidance), cluster 2 – seeking social support copers (i.e., high score on seeking social support), and cluster 3 – adaptive copers (i.e., high scores on problem-solving and seeking social support). While coping profiles are relatively stable over time (Nielsen and Knardahl, 2014), individuals can switch from one profile to another regarding the evolution over time of the stressor and their mental health.

In a cross-sectional and variable-oriented perspective, the relationship between coping strategies and mental health during COVID-19 pandemic is well documented (Babicka-Wirkus et al., 2021; Charbonnier et al., 2021; Le Vigouroux et al., 2021; Leaute et al., 2022; Morales-Rodríguez, 2021; Prowse et al., 2021). Results highlighted that the more students used avoidance coping strategies, such as self-blame or substance use, and the less they used problem-solving and positive thinking, the more they experienced anxiety and depressive symptoms (Charbonnier et al., 2021; Le Vigouroux et al., 2021; Prowse et al., 2021) and the worse their psychological wellbeing was (Dumciene and Pozeriene, 2022; Prasath et al., 2021). Concerning the patterns of coping strategies, before the COVID-19 pandemic, students in high copers or

avoidant copers patterns engaged more in unhealthy behaviors than others (Doron et al., 2015). Furthermore, using an avoidant pattern is positively associated with psychological distress, and contributes to maintaining it over time (Nielsen and Knardahl, 2014). Although the major role played by coping strategies in students' mental health no longer needs to be demonstrated, we have little knowledge of how these strategies evolve over time in the academic year following the COVID-19 pandemic, or of their role in students' mental health.

1.3. Objectives

In sum, it has been widely demonstrated that students' mental health deteriorated during the pandemic, and that these deteriorations have been increased by time and lockdowns. However, we have little information on the mental health of students just after the pandemic and the factors that might influence their health trajectories. The COVID-19 pandemic was a singular major global event which included a level of uncertainty (Rettie and Daniels, 2021). It is therefore important to study students' mental health and how it changed after the third lockdown, at a time when it is still uncertain whether this will be the last. Furthermore, while the links between coping strategies and student mental health during the pandemic have been well established, most of the existing data come from cross-sectional studies (with a variable-oriented approach by considering variables at the level of the entire sample), and therefore do not highlight the role of coping strategies in student mental health trajectories, particularly after the COVID-19 pandemic. Nevertheless, as coping is a multidimensional construct (Sideridis, 2006), a person-oriented approach can capture the dynamic nature of individuals (Bergman and Anderson, 2010) through the identification of subgroups of participants characterized by distinct configurations of a set of variables over time (e.g., Chevrier and Lannegrand, 2022a). Adopting both a variable- and a person-oriented approach leads to a better understanding of the longitudinal relationships between coping strategies and patterns of copers with students' mental health just after the COVID-19 pandemic.

To fill these gaps in the literature, the general aim of this study was to investigate the mental health of students after the last lockdown, by understanding its links with coping strategies (variable and individual approaches) over time. More precisely, this study has two aims. The first is to study the evolution of both students' mental health (anxiety and depressive symptoms, psychological well-being) and coping strategies to deal with the pandemic (problem-solving, seeking social support, positive thinking, and avoidance) at various times in 2021 just after the last lockdown (one month, then five months and 7 months after the third national lockdown). The second is to highlight longitudinal profiles of coping strategies in the face of the pandemic and their link with students' mental health over time.

With regard to our first aim, we hypothesize that mental health (anxiety, depression and well-being) improves the further you are from the period of the third and final national lockdown (hypothesis 1). At the same time, students are less and less likely to use the full range of coping strategies to deal with the pandemic as it draws to a close (hypothesis 2). With regard to our second aim, we hypothesize that four longitudinal profiles of coping strategies to deal with the pandemic among students will be observed: high copers, adaptive copers and avoidant copers, which should decline slightly over time, and low copers which should remain stable over time (hypothesis 3). Lastly, we assumed that students with an avoidant copers profile and those with a low copers profile, will be in poorer mental health than students with other profiles (hypothesis 4).

2. Material and method

2.1. Participants

Initially, 1064 university students were included. However, 684 of them did not respond to at one to the three collections time and were

therefore excluded. In the end, our sample consisted of 380 students who responded to all three questionnaires. It consisted of 302 women, 73 men and 5 non-binary students. Participants were aged between 18 and 29 ($M_{age} = 20.88$, $SD_{age} = 2.28$). Our participants came mainly from the Universities of Paris Cité (17 %), Nîmes (15 %), Lorraine (14 %), Strasbourg (10 %) and Nantes (6 %). They were mainly enrolled in psychology (36 %), sport sciences (11 %), languages (6 %), biology (6 %) and law (5 %). Concerning their levels of education, 26 % were in their first year of a bachelor's degree, 31 % in second year, 17 % in third year, 19 % in master and 4 % in Ph.D. The inclusion criteria to participate in this study were to speak French, be aged between 18 and 29 at the time of the first collection, and to be a student at a French university at all measurement times.

2.2. Procedure

The call for participation was distributed via investigators' social networks and mailing lists within various universities. The first time of data collection was one month after the third and last national lockdown in France, i.e., between June 7th and July 14th, 2021. For most students, this is a period when they have finished their exams and are on holiday. The second time was chosen after the start of the new academic year, between October 12th and November 14th, 2021. The third and final time of data collection was scheduled for the end of the semester, just before the exams, i.e., between December 7th and 20th 2021.

Participation involved completing an online questionnaire on Qualtrics Survey. All participants gave their informed consent before answering the first questionnaire. At the end of the first questionnaire, if they wished, participants were asked to indicate an e-mail address to which invitations to complete the questionnaires for phases 2 and 3 could be sent. In order to respect the anonymity of the data during data processing, at the end of the first questionnaire participants were asked to indicate a code made up of 4 letters and 2 numbers, which they were asked to repeat in subsequent questionnaires. The e-mail addresses collected during the first phase were separated from the data.

2.3. Measures

Anxiety and Depression symptomatology were measured using the French version of the Hospital Anxiety and Depression Scale (HADS; [Bocéréan and Dupret, 2014](#)). This 14-item self-report questionnaire assesses anxiety symptoms (7 items, e.g., "I feel tense or 'wound up'") and depressive symptoms (7 items, e.g., "I feel as if I am slowed down") with labels varying from one item to the next. Scores range from 0 to 21 for each dimension, with higher scores reflecting higher levels of anxiety or depressive symptoms. Scores between 8 and 10 refer to possible anxiety or depression, and scores equal to or >11 indicate probable anxiety or depression. The internal consistency at the three times was satisfactory for both dimensions (Anxiety: $\alpha_{T1} = 0.85$, $\alpha_{T2} = 0.84$, and $\alpha_{T3} = 0.86$; and Depression $\alpha_{T1} = 0.84$, $\alpha_{T2} = 0.85$, and $\alpha_{T3} = 0.87$).

Well-being was measured using the French version of the psychological well-being scale ([Cottraux, 2009](#)). This scale is composed of 18 items (e.g., "People would describe me as a giver and someone who is willing to share my time with others.") to which participants respond on a 6-point scale from 1 "Disagree" to 6 "Agree". The internal consistency at the three times was satisfactory ($\alpha_{T1} = 0.79$, $\alpha_{T2} = 0.83$, $\alpha_{T3} = 0.82$).

Coping strategies to deal with the pandemic was measured using the French version of Brief-cope ([Muller and Spitz, 2003](#)). This scale measures 14 coping strategies which can be grouped into 4 categories ([Baumstarck et al., 2017](#)): *seeking social support* with venting (e.g., "I vented my unpleasant feelings by talking about it."), emotional support (e.g., "I sought someone's support and understanding."), instrumental support (e.g., "I sought help and advice from others.") and religion (e.g., "I prayed or meditated."); *problem-solving* with active coping (e.g., "I determined a course of action and followed it.") and planning (e.g., "I've planned the steps to follow."); *avoidance* with behavioral disengagement

(e.g., "I've given up hope of coping."), self-distraction (e.g., "I turned to work or other activities to take my mind off things."), substance use (e.g., "I used alcohol or other substances to feel better."), denial (e.g., "I refused to believe it was happening to me.") and self-blame (e.g., "I blamed myself for the things that happened to me."); and finally *positive thinking* with humor (e.g., "I took the situation in stride."), positive reframing (e.g., "I tried to see the situation in a more positive light.") and acceptance (e.g., "I've learned to live with my new situation."). Participants answer on a 4-point scale from 0 "Not at all" to 3 "Absolutely". At the three times, internal consistency indices for seeking social support ($\alpha_{T1} = 0.84$, $\alpha_{T2} = 0.84$, $\alpha_{T3} = 0.86$), problem solving ($\alpha_{T1} = 0.79$, $\alpha_{T2} = 0.81$, $\alpha_{T3} = 0.81$), avoidance ($\alpha_{T1} = 0.71$, $\alpha_{T2} = 0.71$, $\alpha_{T3} = 0.75$) and positive thinking ($\alpha_{T1} = 0.80$, $\alpha_{T2} = 0.80$, $\alpha_{T3} = 0.81$) were satisfactory.

2.4. Statistical analyses

First, in relation to our first objective, we studied the evolution of both students' mental health and coping strategies to deal with the pandemic at the three targeted times in 2021, using repeated measures ANOVA.

Second, in relation to our second objective, we investigated coping strategy profiles over the three times. Longitudinal Cluster Analysis (LCA) using *k*-means with Euclidean distance was used ([Genolini et al., 2015](#)). LCA, a non-parametric method, allows the identification of specific longitudinal profiles (i.e., common patterns of change) considering several variable trajectories simultaneously. We used "randomAll" as the initialization method, meaning that all participants were randomly assigned to a longitudinal cluster and the mean of each longitudinal cluster at each measurement time is the cluster center. The range of *k*-cluster solutions examined was from 2 to 6 which means 2 profiles less and 2 profiles more than those found by [Doron et al. \(2015\)](#) in a cross-sectional approach. The selection of the final number of clusters was made regarding the Calinski-Harabatz criterion, a criterion that combines the within-cluster and between-cluster matrices to evaluate the quality of the distribution ([da Silva Galvao Garcia, 2020](#); [Genolini and Falissard, 2011](#)). This criterion has been recognized as a main indicator in LCA ([da Silva Galvao Garcia, 2020](#)) and was completed by classical cluster criteria (e.g., [Chevrier and Lannegrand, 2022b](#)): substantive theorizing, parsimony and explanatory power. Cluster patterns were identified using *z*-scores and [Cohen's \(2013\)](#) conventional criteria: an absolute value of 0.2 SD defined a small effect, 0.5 SD a moderate effect, and 0.8 SD a large effect. Cluster stability at the within level was estimated with respect to the difference between *z*-value scores at T1, T2, and T3 as in [Chevrier and Lannegrand \(2022b\)](#).

Finally, also in line with our second objective, repeated measures mixed analyses of variance (ANOVA) were carried out to compare scores on anxiety, depression, and psychological well-being as a function of time and coping strategy profile. A significant interaction effect was followed by post-hoc analyses using a pairwise comparison method. As this method involves a sequence of comparative analyses within the same dataset, the significance threshold must be protected (α^*). Bonferroni's conservative procedure ($\alpha^* = 0.05/r$, where *r* is the number of simple interactions calculated, $\alpha^* = 0.025$ in this case) was used ([Kassambara, 2019](#)). Analyses were conducted with *kml3d* 2.4.2 ([Genolini et al., 2015](#)), *tidyverse* 1.3.2 ([Wickham et al., 2019](#)), *ggpubr* 0.4.0 ([Kassambara, 2023a](#)), and *rstatix* 0.7.0 ([Kassambara, 2023b](#)) packages in R 4.1.2 software. Participants considered as outliers were removed. Analyses were conducted on samples ranging from 361 to 375 participants.

3. Results

3.1. Evolution over time of students' mental health and coping strategies

Our results ([Table 1](#)) show that the levels of well-being were similar at the three measurement times. Differences, although small, were

Table 1
Descriptive analyses of mental health and coping strategies and repeated measures Anova results between three data collection times.

	T1			T2			T3			η^2	T1-T2		T1-T3		T2-T3		
	M	SD	K	M	SD	K	M	SD	K		S	d	t	d	t	d	t
Mental health																	
Anxiety	7.69	4.48	0.54	-0.36	4.52	0.42	-0.50	4.77	0.47	-0.60	8.72***	-0.12	-0.18	-3.95***	-0.18	-0.81	-0.03
Depressive	4.99	3.85	0.72	-0.22	4.04	1.14	1.23	4.27	0.80	-0.02	7.01***	0.45	-0.12	-2.99**	-0.12	-3.44**	-0.14
Psychological wellbeing	78.73	11.45	-0.55	0.19	12.29	-0.57	0.25	12.08	-0.55	0.34	0.85	1.21	0.04	1.03	0.03	-0.18	0.01
Coping strategies																	
Problem-solving	2.18	1.43	0.44	-0.27	1.49	0.31	-0.63	1.42	0.44	-0.24	3.87*	-0.30	-0.01	2.25*	0.10	2.55*	0.12
Positive thinking	2.86	1.26	0.34	-0.29	1.26	0.30	-0.26	1.26	0.33	-0.28	2.43	-1.83	-0.07	0.15	0.01	1.98	0.08
Seeking social support	2.15	1.26	0.27	-0.55	1.25	0.23	-0.60	1.27	0.24	-0.61	2.51	-2.16	-0.08	-1.58	-0.06	0.59	0.02
Avoidance	1.72	0.89	0.51	-0.02	1.72	0.92	0.18	0.98	0.55	0.12	0.44	-0.06	0.002	0.78	0.03	0.84	0.03

Note. M: Mean; SD: Standard Deviation; S: Skewness; K: Kurtosis; *: $p < .05$, **: $p < .01$, ***: $p < .001$.

observed, however, over time in anxiety symptoms (which increased very slightly at T2 and T3 compared with T1; the prevalence of probable anxiety was 25.59 % at T1, 28.72 % at T2, and 31.33 % at T3), and in depressive symptoms (which increased very slightly at T3; the prevalence of probable depression was 11.23 % at T1, 10.44 % at T2, and 12.79 % at T3). Concerning the evolution of coping strategies, our results showed low levels of fluctuation over time for three strategies: seeking social support (which increased slightly between T1 and T2), problem-solving (which decreased slightly at T3 compared with the other two times) and positive thinking (which decreased slightly between T2 and T3).

3.2. Relationships between students' mental health and coping strategies: a person-oriented approach

Combining the twelve dimensions of coping strategies (i.e., four dimensions per time: problem-solving_T1, problem-solving_T2, problem-solving_T3, positive thinking_T1, positive thinking_T2, and positive thinking_T3, avoidance_T1, avoidance_T2, avoidance_T3, seeking social support_T1, seeking social support_T2, seeking social support_T3), five solutions were examined: two-cluster, three-cluster, four-cluster, five-cluster, and six-cluster. The Calinski-Harabatz criterion revealed that a three- or a five-cluster solution was the best partitioning result. The percentage of individuals correctly classified was 95.03 % for the three-cluster and 94.25 % for the five-cluster solution. Nevertheless, regarding the other criterion, the five-cluster solution seemed to be the best one as it explained more variance of each dimension and led to a more discriminant solution. The five-cluster solution (Fig. 1) accounted for 40.69 % of variance for 35.80 % for problem-solving_T1, 34.40 % for problem-solving_T2, 33.05 % for problem-solving_T3, 42.57 % for positive thinking_T1, 41.23 % for positive thinking_T2, and 37.51 % for positive thinking_T3, 50.05 % for avoidance_T1, 52.86 % for avoidance_T2, 54.25 % for avoidance_T3, seeking social support_T1, 46.39 % for seeking social support_T2, 43.95 % for seeking social support_T3. A discriminant function analysis supported this final cluster solution: Wilks' lambda = 0.06, $\chi^2(48) = 1054.8, p < .001$.

Different patterns were highlighted. Differences between means and standard deviation at T1, T2 and T3 for each profile are reported in Table 2. The *low copers* cluster (profile A) kept the same pattern over time with low scores on all dimensions of coping. The *active copers* cluster (profile B) had high and decreasing scores of problem-solving and high and increasing scores of positive thinking. Scores of avoidance and seeking social support remained moderate and stable. The *social support copers* cluster (profile C) had a very high and increasing score of seeking social support between T1 and T2, high and stable scores of problem-solving and avoidance, and a moderate and stable score of positive thinking. The *avoidant copers* cluster (profile D) had a very high and stable score of avoidance, with moderate to low scores of positive thinking, problem solving, and seeking social support. The problem solving score increased at T2 before decreasing at T3. Lastly, the *positive thinking* cluster (profile E) had very high and decreasing scores of positive thinking with low scores of avoidance, problem solving, and seeking social support. The problem solving score decreased between T1 and T2 and then remained stable.

Differences in mental health according to the coping strategy pattern are reported in Table 3. Students in the avoidant profile (profile D) were characterized by higher levels of anxiety and depressive symptoms and lower levels of well-being than students in the other four profiles, for all the collection times. Low copers (profile A) were characterized by moderate levels of anxiety and depressive symptoms and of well-being. Students in the seeking social support profile (profile C) were characterized by a high level of well-being, but at the same time a high level of anxiety and a moderate level of depressive symptoms. Students with active coping or positive thinking profiles (respectively profiles B and E) had higher levels of well-being and lower levels of anxiety and depressive symptoms than students in the other three profiles, at all collection

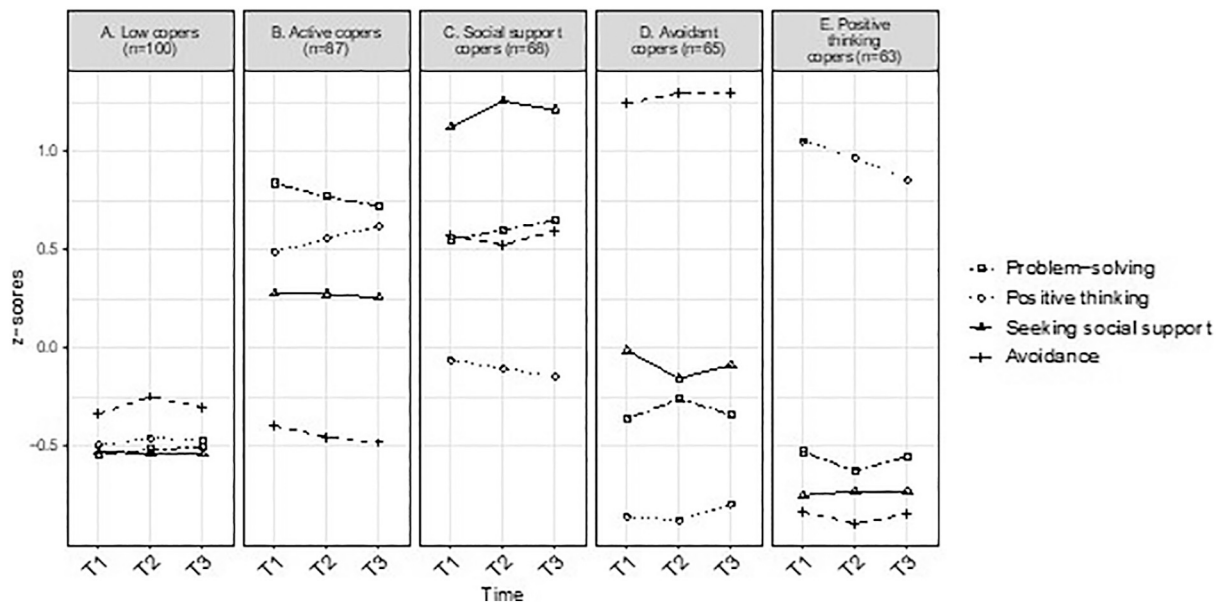


Fig. 1. Longitudinal cluster solution for the coping strategies.

Table 2

Differences between means, standard deviation, and z-values of coping strategies dimensions across time for each profile.

	A. Low copers			B. Active copers			C. Social support copers			D. Avoidant copers			E. Positive thinking copers		
	M	SD	z	M	SD	z	M	SD	z	M	SD	z	M	SD	z
Problem solving															
T1	1.41	0.96	-0.54	3.38	1.21	0.84	2.97	1.26	0.55	1.68	1.21	-0.36	1.43	1.16	-0.53
T2	1.43	1.16	-0.52	3.35	1.41	0.77	3.09	1.44	0.60	1.82	1.25	-0.26	1.27	1.08	-0.62
T3	1.32	1.04	-0.50	3.06	1.21	0.72	2.96	1.38	0.65	1.55	1.12	-0.34	1.25	1.08	-0.56
Δ T1-T2	0.02	0.20	0.02	-0.03	0.20	-0.07	0.12	0.18	0.05	0.14	0.04	0.10	-0.16	-0.08	-0.09
Δ T2-T3	-0.11	-0.12	0.02	-0.29	-0.20	-0.05	-0.13	-0.06	0.05	-0.27	-0.13	-0.08	-0.02	0.00	0.06
Δ T1-T3	-0.09	0.08	0.04	-0.32	0	-0.12	-0.01	0.12	0.10	-0.13	-0.09	0.02	-0.18	-0.08	-0.03
Positive thinking															
T1	2.25	0.84	-0.49	3.48	1.04	0.49	2.79	1.07	-0.06	1.79	0.89	-0.86	4.19	0.94	1.05
T2	2.38	0.77	-0.46	3.66	1.09	0.56	2.83	1.04	-0.10	1.86	0.93	-0.87	4.17	1.03	0.97
T3	2.27	0.88	-0.47	3.64	1.14	0.62	2.68	1.03	-0.14	1.86	0.89	-0.79	3.93	1.03	0.85
Δ T1-T2	0.13	-0.07	0.03	0.18	0.05	0.07	0.04	-0.03	-0.04	0.07	0.04	0.01	-0.02	0.09	-0.08
Δ T2-T3	-0.11	0.11	-0.01	-0.02	0.05	0.06	-0.15	-0.01	-0.04	0.00	-0.04	0.08	-0.24	0.00	-0.12
Δ T1-T3	0.02	0.04	0.02	0.16	0.10	0.13	-0.11	-0.04	-0.08	0.07	0.00	0.07	-0.26	0.09	-0.20
Seeking social support															
T1	1.49	0.99	-0.53	2.50	0.95	0.28	3.57	0.87	1.12	2.13	1.09	-0.01	1.21	0.97	-0.74
T2	1.59	0.93	-0.53	2.59	0.86	0.27	3.81	0.81	1.25	2.06	0.96	-0.15	1.34	1.04	-0.73
T3	1.54	0.99	-0.53	2.55	0.90	0.26	3.76	0.91	1.21	2.12	1.03	-0.08	1.30	0.95	-0.73
Δ T1-T2	0.10	-0.06	0.00	0.09	-0.09	-0.01	0.24	-0.06	0.13	-0.07	-0.13	-0.14	0.13	0.07	0.01
Δ T2-T3	-0.05	0.06	0.00	-0.04	0.04	-0.01	-0.05	0.10	-0.04	0.06	0.07	0.06	-0.04	-0.09	0.00
Δ T1-T3	0.05	0.00	0.00	0.05	-0.05	-0.02	0.19	0.04	0.09	-0.1	-0.04	-0.07	0.07	-0.02	0.01
Avoidance															
T1	1.42	0.63	-0.33	1.37	0.52	-0.39	2.23	0.73	0.57	2.83	0.71	1.24	0.98	0.58	-0.83
T2	1.50	0.60	-0.24	1.31	0.55	-0.45	2.20	0.66	0.52	2.91	0.79	1.29	0.90	0.59	-0.89
T3	1.40	0.67	-0.30	1.22	0.57	-0.48	2.28	0.71	0.60	2.96	0.75	1.30	0.87	0.64	-0.84
Δ T1-T2	0.08	-0.03	0.10	-0.06	0.03	-0.06	-0.03	-0.07	-0.05	0.08	0.08	0.05	-0.08	0.01	-0.06
Δ T2-T3	-0.10	0.07	-0.06	-0.09	0.02	-0.03	0.08	0.05	0.08	0.05	-0.04	0.01	-0.03	0.05	0.05
Δ T1-T3	-0.02	0.04	0.03	-0.15	0.05	-0.09	0.05	-0.02	0.03	0.13	0.04	0.06	-0.11	0.06	-0.01

times.

Intra-profile comparisons revealed two significant differences. The first concerned the level of anxiety for students who coped with the pandemic by seeking social support (Profile C). These students reported higher levels of anxiety symptoms at Time 2 and Time 3 than at Time 1. The second concerns the level of depressive symptoms for students characterized by coping with the pandemic via avoidance (Profile D).

These students reported higher levels of depressive symptoms at Time 3 than at Time 1 and Time 2.

4. Discussion

Taking into account the significant deterioration in students' mental health and the central role of coping strategies in this deterioration, this

Table 3
Repeated measures mixed analysis of variance for anxiety, depression, and wellbeing regarding time measurement and coping strategies profiles.

	M (SD)			Main effect of time		Main effect of profiles		Interaction effect time × profiles		Inter-profile comparisons			Intra-profile comparisons
	T1	T2	T3	F-value	df	F-value	df	F-value	df	T1	T2	T3	
Anxiety	–	–	–	8.81**	1.93, 704.21	54.72***	4, 365	1.80	7.72, 704.21				
A. Low copers	7.56 (4.29)	7.69 (3.97)	7.38 (3.93)	–	–	–	–	–	–	D > C > A	D > C > A	D > C > A	–
B. Active copers	5.67 (2.53)	5.99 (3.08)	6.34 (3.22)	–	–	–	–	–	–	B > E	B > E	B > E	–
C. Social support copers	8.58 (3.70)	9.61 (4.33)	9.79 (4.31)	–	–	–	–	–	–				T1 < T2 T3
D. Avoidant copers	12.00 (4.14)	12.00 (4.02)	13.00 (4.71)	–	–	–	–	–	–				–
E. Positive thinking copers	4.20 (3.07)	5.22 (2.99)	5.02 (3.07)	–	–	–	–	–	–				–
Depression	–	–	–	7.04*	1.93, 685.45	72.54***	4, 356	2.72*	7.7, 685.45				
A. Low copers	5.40 (3.65)	4.92 (3.21)	5.42 (3.55)	–	–	–	–	–	–	D > A > C	D > A > C	D > A > C	–
B. Active copers	2.80 (2.05)	2.56 (1.96)	2.52 (1.98)	–	–	–	–	–	–	C > B E	C > B E	C > B E	–
C. Social support copers	5.37 (3.45)	5.00 (3.29)	5.74 (3.53)	–	–	–	–	–	–				–
D. Avoidant copers	8.38 (3.81)	8.75 (4.46)	10.20 (3.94)	–	–	–	–	–	–				T3 > T1 T2
E. Positive thinking copers	2.16 (1.60)	2.14 (1.59)	2.42 (1.94)	–	–	–	–	–	–				–
Wellbeing	–	–	–	1.19	1.96, 725.10	35.85***	4, 370	0.63	7.84, 725.10				
A. Low copers	76.40 (9.66)	76.20 (10.80)	76.60 (10.30)	–	–	–	–	–	–	B E C > A > D	B E C > A > D	B E C > A > D	–
B. Active copers	84.00 (8.75)	84.30 (9.02)	84.70 (8.86)	–	–	–	–	–	–				–
C. Social support copers	82.20 (8.73)	81.10 (9.08)	81.10 (9.91)	–	–	–	–	–	–				–
D. Avoidant copers	69.00 (11.20)	68.00 (12.00)	67.50 (11.10)	–	–	–	–	–	–				–
E. Positive thinking copers	83.50 (8.70)	82.60 (10.90)	82.50 (9.87)	–	–	–	–	–	–				–

* $p < .05$, ** $p < .01$, *** $p < .001$; For comparison, only significant p -adjusted <0.025 inter- and intra-profile comparisons are reported.

study aimed to better understand the mental health of students after the last lockdown, by understanding its links with coping strategies (variable approach and individual) over time. The originality of this study therefore lies in 1. investigating students' post-pandemic experiences, using a longitudinal approach, and 2. examining students' longitudinal coping profiles and their links with their mental health. This study had two main objectives. The first was to look at the evolution of students' mental health and coping strategies to deal with the COVID-19 pandemic after the third and final national lockdown. The second was to highlight coping strategies patterns in the face of the pandemic and their consequences for students' mental health. Our results show that students can be differentiated according to 5 temporal profiles of coping with the pandemic which are relatively stable over time and explain differences in mental health.

We found that well-being and symptoms of anxiety and depression remained fairly stable over time, apart from a slight increase in symptoms observed during university periods, mainly before exams. This finding reinforces the literature (e.g., Charbonnier et al., 2022) and underlines the importance of considering the temporality of the university year (Dupont et al., 2015) as well as the perceived academic

pressure associated with it (Levesque et al., 2004) to better support students' mental health. Note that, at all three collection times, although the prevalence of depressive symptoms fell to a level similar to that observed before the pandemic (e.g., Andrews and Wilding, 2004), the proportions of students presenting probable anxiety are similar to those observed among French students during lockdown periods (Charbonnier et al., 2021, 2022, 2023; Le Vigouroux et al., 2021). Even 7 months after the last national lockdown, students remained vulnerable in terms of anxiety following the pandemic. These results point out the difference of the consequences of the COVID-19 pandemic on depressive and anxiety symptoms. It is possible that the uncertainty of the evolution of the pandemic after three lockdowns maintains anxiety symptoms, but does not influence depressive symptoms (Van Zyl et al., 2021). This suggests that the pandemic may have had a long-term deleterious effect on students' anxiety symptoms, which remains to be confirmed in future studies.

Regarding the evolution of coping strategies, our results showed that strategies remained fairly stable over time, apart from a slight increase in seeking social support at the start of the academic year, and a decrease in problem-solving and positive thinking before exams. This stability in

the use of strategies can be explained, on the one hand, by the uncertainty surrounding the evolution of the pandemic, the maintenance of protective measures and the fear of COVID-19 (Charbonnier et al., 2023).

Next, consistent with our hypotheses, the mental health of students varied according to their coping profile. Specifically, our results showed that students belonging to the *avoidant copers* profile (i.e., who preferentially used coping focused on avoidance whatever the period) were the ones with the most anxiety and depressive symptoms, and the poorest well-being, at our different measurement times. Consequently, coping focused on avoidance seems to be a central process in students' mental health, which had already been highlighted before the pandemic (e.g., Dyson and Renk, 2006), and in studies conducted during the pandemic (e.g., Carnahan et al., 2022). While avoidance may be considered functional in the short term to cope with situations with a low level of control (as was possibly the case with the pandemic), this coping category also includes strategies such as self-blame, denial or substance use, which reduce mental health. Thus, coping with the pandemic by preferring to use strategies to avoid the elements associated with it, both during the period of lockdown and afterwards, seems to be a particularly risky way to deal with the stressor for students' mental health.

Conversely, the two profiles of *active copers* (i.e., who used mostly coping focused on problem solving, specifically after the third lockdown, and coping focused on positive thinking, specifically during term-time) and *positive thinking copers* (i.e., characterized by very high use of positive thinking, specifically after lockdown periods and the university year) were associated with better mental health (fewer anxiety and depressive symptoms, and greater well-being), across all our measurement times. In line with what has been observed in other studies (e.g., Garland et al., 2010; Kleinkorres et al., 2020) and in line with the broaden-and-build theory (Fredrickson, 1998, 2000), experiencing positive emotion enables individuals to access a wider repertoire of strategies for thinking and acting, which in turn enhances their performance and their ability to cope with situations, thereby boosting their well-being. These results suggest that strategies focused on problem-solving and positive thinking are particularly effective in preserving students' mental health. These strategies should be encouraged and/or consolidated among students.

Finally, our last two profiles, *social support copers* (i.e., who used both coping focused on social support seeking, specifically during term-time, and coping focused on problem-solving and avoidance) and *low copers* (i.e., who used few coping strategies whatever the time of the year), appear to be intermediate profiles. These profiles were less associated with deterioration in mental health than *avoidant copers*, but more associated with distress than the profiles *active copers* and *positive thinking copers* (except in well-being for *social support copers*). Concerning the *low copers*, this can be partly explained on the one hand by the fact that experiencing negative emotions reduces an individual's attentional span and access to their strategy repertoire (Garland et al., 2010), and on the other hand by the fact that coping is a competence that can be learned at every stage of development (Mikolajczak et al., 2014). It is possible that some students have not had the opportunity to develop their regulation skills to deal with this exceptional event, possibly because they did not perceive the pandemic situation as particularly threatening. With regard to the nuanced role of social support strategies, this result may seem surprising in that it has been widely demonstrated that the more support people feel, the less anxiety and the fewer depressive symptoms they exhibit (for reviews and meta-analyses, see: Gabarrell-Pascuet et al., 2023; Harandi et al., 2017). However, we can assume that it is not so much the search for social support that preserves the quality of mental health, but the perception of the social support received. Moreover, it is also possible that the search for social support evolved into a co-rumination phenomenon, fostering emotional distress (Starr et al., 2021). To confirm this, it would seem important in future studies to also measure students' satisfaction and the availability of social support, as

well as co-rumination.

Although this study adds to the literature on the post-pandemic adjustment of French students, thanks to its longitudinal data collection and original analyses, it does have some limitations. The size of our sample, the higher proportion of students in psychology training, and the imbalance between men and women mean that we must be cautious about generalizing our results. In addition to studying the even longer-term consequences of the pandemic on students' mental health, it would be interesting to pursue studies linking their mental health to the implications for investment in training and educational applications (e.g., pandemic has increased digital learning) (Saha et al., 2021).

5. Conclusion

In conclusion, students are a particularly vulnerable population, for whom repeated lockdown has increased vulnerability (particularly concerning anxiety symptoms) even though the pandemic is under control. This study highlights the consequences of the pandemic, especially on anxiety symptoms. Furthermore, our results highlighted five longitudinal coping profiles for dealing with the pandemic, with varying degrees of association with mental health.

CRediT authorship contribution statement

Sarah Le Vigouroux: Writing – original draft, Formal analysis, Data curation. **Basilie Chevrier:** Writing – original draft, Formal analysis, Conceptualization. **Lucile Montalescot:** Writing – original draft, Data curation, Conceptualization. **Elodie Charbonnier:** Writing – original draft, Funding acquisition, Data curation, Conceptualization.

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Declaration of competing interest

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Appendix A. Supplementary data

Relationships between students' mental health and coping strategies are presented in supplementary material. Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jad.2025.02.007>.

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