

# IMPACT OF THE COVID-19 PANDEMIC AND LOCKDOWNS ON THE EDUCATION AND MENTAL HEALTH OF PHYSIOTHERAPY STUDENTS IN FRANCE: A DESCRIPTIVE CROSS-SECTIONAL STUDY WITH NATIONAL ONLINE SURVEY

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**Objective:** To determine the impact of the SARS-CoV-2 (COVID-19) pandemic and lockdowns on the mental health status, training, perceptions of the physiotherapy profession, and career plans of French physiotherapy students.

**Design:** A descriptive cross-sectional study was conducted, representing the first and only survey of its kind, using a national online survey.

**Subjects:** A total of 2678 French physiotherapy students participated in the study.

**Methods:** Mental health status was assessed using the validated French versions of established depression, anxiety, and insomnia scales.

**Results:** The survey revealed that female sex, age below 21 years, living alone, and having a psychiatric history or COVID-19 risk factors were associated with more severe symptoms of depression, anxiety, and insomnia in the surveyed students. In addition, stress, anxiety, and depression induced by the COVID-19 crisis were linked to apprehension about continuing practical training in physiotherapy. These factors also affected students' perceptions of the profession and the initially envisioned mode of practice, particularly among fifth-year students (odds ratio (OR)=2.25, 95% confidence interval (95% CI)=(1.69, 2.99),  $p < 0.001$ ). Notably, the pandemic significantly reduced the desire of these students to pursue a career as physiotherapists (adjusted OR (aOR) 1.41 (1.06, 1.86)).

**Conclusion:** French physiotherapy students, especially those in their fifth year, have experienced significant impacts from the COVID-19 pandemic, affecting their mental health, education, perceptions of the physiotherapy profession, and career plans.

**Key words:** COVID-19; lockdown; physiotherapy students; mental health; physiotherapy education.

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## LAY ABSTRACT

The COVID-19 pandemic alters the mental health and education of French physiotherapy students. Students in their final year of physiotherapy studies were particularly affected notably in terms of career plans.

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During the SARS-CoV-2 (COVID-19) pandemic, physiotherapists (1) were directly involved in treating and caring for patients infected with COVID-19. These physiotherapists were at risk of developing psychological distress and other mental health symptoms (2). Rehabilitation teams are not exempt from this problem, with a recent study conducted in South Korea (2) reporting that of the 65 physiotherapists who completed the survey, 32.3% reported symptoms of anxiety and 18.5% exhibited symptoms of depression.

The pandemic, lockdown, and their consequences appear to have affected medical students especially strongly. For example, COVID-19 lockdowns necessitated the replacement of traditional hands-on practice with e-learning sessions (3). Furthermore, recent studies (4–8) have highlighted the impact of the COVID-19 pandemic on stress, anxiety, depression, and feelings of helplessness experienced by university undergraduate students. Moreover, the fear of COVID-19 was found to cause anxiety among these students regarding their future careers, thus having long-term negative psychological effects (9).

A recent study (10) showed that this pandemic period had a particularly profound impact on physiotherapy students, who are more inclined to develop stress and

stomatognathic system disorders (11). Moreover, the learning environment for these students, which requires manual practice through mentoring in France, was entirely constrained. In response to these pandemic-related changes, physiotherapy students had the potential to be affected in very different ways, some positively and some negatively. Interestingly, no national study to date has reported on the relationship between the COVID-19 pandemic and the mental health of French physiotherapy students or its effects on their education.

Thus, the study hypothesis is that the consequences of the pandemic will be disastrous for education and training where physical contact and social interaction are consubstantial with the development of professional skills, such as physiotherapy. In particular, during the lockdown periods in France, from March to May and from October to December 2020, most physiotherapy schools worldwide were closed, and training was conducted through e-learning sessions (12–14).

However, limited worldwide data are available, and no study has yet been conducted on French physiotherapy students to assess the actual impact of the COVID-19 pandemic on their mental health and training, especially in relation to their respective years in physiotherapist education.

This descriptive cross-sectional study, including a national online survey, aimed to evaluate the impact of the COVID-19 pandemic on the mental health status of French physiotherapy students. The study also investigated its impact on their education, perceptions of the physiotherapy profession, and career plans. The study hypothesis posited that the COVID-19 pandemic period would negatively affect the mental health status, training, perceptions of the physiotherapy profession, and career plans (including the decision to become a physiotherapist and the modalities of professional practice) among the surveyed French physiotherapy students.

## METHODS

### *Study design*

A descriptive cross-sectional study was conducted using a national online survey (disseminated using SurveyMonkey®) of physiotherapy students in France. This survey was pre-tested by 2 experts in physiotherapy and teaching in physiotherapy schools to assess its comprehension and acceptability. This survey assessed the impact of the COVID-19 pandemic on the mental health (primary outcome), training, perceptions of the physiotherapy profession, and career plans (secondary outcomes) of French physiotherapy students.

### *Ethics considerations*

Considering French law, this study is non-interventional, but involves the collection of self-reported health data, and must receive approval from a local ethics committee. There-

fore, the protocol was submitted and approved by the local ethics committees of Paris-Saclay University (CER-Paris-Saclay-2020-095) and the French data protection authority (number 2213682v0). In accordance with established ethical standards, participants were given comprehensive information and had the freedom to choose not to respond or to discontinue their participation at any point during the survey. All participants provided written consent after being informed about the nature and purpose of the study.

### *Setting*

The survey was distributed using the mailing list of France's National Association of Physiotherapy-school Directors ("SNIFMK", which represents 35 physiotherapy French schools) and the National Association of Physiotherapy Students (FNEK). The survey was distributed from directors to students by email to each student representative office and to all students of each school. All schools, including public and private, in France were contacted.

This survey was available online from 29 November to 15 December 2020. The survey is shown in Appendix S1. The distribution over the French territory and the status of the physiotherapy schools in the sample was representative of the "population" of the physiotherapy schools.

### *Participants*

The target and eligible population and the eligibility criteria corresponded to second- to fifth-year physiotherapy students in France. It is important to note that second-year physiotherapy students must be considered a specific population because they had not yet attended physiotherapy school during the first lockdown, since the first year is a common year with other university medical programmes in France. Concerning the health risk factor for severe COVID-19, the following elements were considered: smoking, physical inactivity, hypertension, primary immunodeficiency, cancer, chronic kidney disease, obesity, advanced age, diabetes, mental illness, pregnancy, cerebrovascular disease, asthma, chronic lung and liver diseases, heart disease, or cystic fibrosis.

Concerning the sources and methods of selection, all of the participants were recruited through the survey. Participants were able to complete the survey at any time during the period mentioned above. All data were self-reported by the participants. The survey was anonymous, and data confidentiality was assured in accordance with the European General Data Protection Regulation.

### *Outcomes*

The primary outcome of this study was the mental health of study participants, which was assessed using the validated French versions of the depression (Patient Health Questionnaire-9; PHQ-9) (15, 16), anxiety (General Anxiety Disorder-7; GAD-7) (17), and insomnia (Insomnia Severity Index; ISI) (18) scales.

For secondary outcomes, the impact of the health crisis on student training was assessed through closed-ended questions on increased workload (4 possible response levels), possible access to digital resources (dichotomous response), and perception of the overall impact of the crisis on the quality of their training (5-point Likert scale). Changes in students' perceptions of the physical therapy profession were assessed with a closed 5-point Likert-type question. Finally, the impact of the crisis on students' career plans was assessed by asking about a possible change in the desire to practice this profession (4 levels of possible

answers), the initial installation plan of the future professional (multiple choice), and any possible change of plan since the health crisis (dichotomous answer).

The independent variables analysed in this study included demographic characteristics (age, sex, training year, social and economic situation). Students were also asked about whether they had any risk factors for COVID-19 infection, whether they had a history of psychological or psychiatric disorders, and whether they increased their alcohol or drug use during the lockdown.

### Statistical methods

According to the French Directorate of Research, Studies, Evaluation, and Statistics (DRESS), the number of physiotherapy students in the 47 French physiotherapy schools was estimated to be 12,147 in 2020 (19). The population was evenly distributed across the 4 years of school, with 59.54% female and 40.49% male students. The study relied on this data to assess the representativeness of the studied sample. Thus, for the surveyed population using an ideal random sampling strategy, the minimum required sample size was 2,005 respondents, with a margin of error of 2% and a confidence level in the responses of 95% (20).

For the analyses, the qualitative variables were used with the same response items as those of the questionnaire. For the quantitative variable "age of the respondent," the sample was dichotomized at the median (median=21 years, which was very close to the mean=21.8 years).

Data analysis was performed using R Statistical Software (v4.0.0; R Core Team 2021). Descriptive data are presented as numbers and percentages for qualitative variables. An odds ratio was calculated to determine the consequences of the COVID-19 pandemic on French physiotherapist students' perceptions. For quantitative variables, means and standard deviations (SD) were used to describe these results when they were normally distributed.  $\chi^2$  tests or Fisher's exact test were used to compare subgroups when validity conditions were met. Independent variables included demographic characteristics and risk factors, while dependent variables included students' mental health status and perspectives on the physiotherapy profession. Logistic regression analyses were used to assess the impact of the COVID-19 pandemic on the training of French physiotherapy students. The statistical level of significance was set at 5%.

## RESULTS

### Participants

A total of 2678 complete responses to the survey were received. Students were distributed across all 47 French physiotherapy schools. Characteristics of the study sample were similar to national data from DRESS (19) regarding the training year and the public or private status of the training institution (Table I). However, the survey respondents, comprising 68.8% females and 31.2% males, indicated a slight overrepresentation of females compared with the actual population. The minimum required sample size was thus achieved. The margin of error with a 95% confidence interval could be calculated at  $\pm 1.67\%$  (20).

### Primary outcomes

*Experiences of the French physiotherapist students' during the COVID-19 pandemic.* The mean age of the participants was  $21.8 \pm 3.03$  years, and a majority were women (68.8%). Of these French students, 64% reported that the first lockdown period was worse than the second (18%) (Table I). In terms of their overall health, 6% of participants reported having at least 1 health risk factor for severe COVID-19 (Table II). With regards to mental health during the pandemic, approximately 32% of participants reported experiencing moderate to severe anxiety, approximately 63% reported experiencing depression, and 58.10% reported experiencing insomnia (Table II).

**Table I.** Characteristics of respondents to a survey of French physiotherapy students, 2021

	Sample (n (%)) N = 2678	National data* (n (%)) N = 11,254
Sex		
Female	1,843 (68.8)	7,232 (59.5%)
Male	835 (31.2)	4,915 (40.5%)
Age, mean $\pm$ SD (years)	21.8 $\pm$ 3.03	
Training year		
Second	595 (22.2)	3,085 (25.4)
Third	698 (26.1)	3,098 (25.5)
Fourth	694 (25.9)	3,029 (24.9)
Fifth	691 (25.8)	2,935 (24.2)
Type of training institution <sup>a</sup>		
Public	1,321 (51.7)	
Private	1,233 (48.3)	44.7
Missing data	124	55.3
Live alone		
Yes	952 (35.5)	
No	1,726 (64.5)	
Have a loan to finance training		
Yes	618 (23.1)	
No	2,060 (76.9)	
Have a job during training		
Yes	632 (23.6)	
No	2,046 (76.4)	
Experience lockdown in March 2020		
Yes	2,105 (78.6)	
No	573 (21.4)	
Impact of the first lockdown (March 2020 <sup>b</sup> ) on training		
Less than the second	485 (18.1)	
Equal	470 (17.6)	
More than the second	1,723 (64.3)	
Careers plans		
Private practice	1,483 (55.4)	
Mixed practice (public/private)	664 (24.8)	
Salaried practice in rehabilitation centre	213 (8.0)	
Salaried practice in nursing home	4 (0.1)	
Other salaried practice	86 (3.2)	
Hospital practice	228 (8.5)	

<sup>a</sup>This is declarative data from the students who responded to the survey. The percentages indicated at the national level correspond to real proportion.

<sup>b</sup>In the context of the COVID-19 pandemic, universities and higher education establishments were closed by Ministerial ordinance during a period in France. However, not all French physiotherapy students were still in their physiotherapy studies at the time of the lockdown, since the survey questionnaire was administered a year later, and derogations were in force for health students who helped during the crisis, depending on the year, in clinical services.

\*The national number mentioned in Table I was obtained from (19) French Ministry of Health (19). It was assumed that no student had repeated a year of training, given the relatively stable numbers observed. The demographic characteristics and specialties of the participants are described in Table 1. The national numbers presented in Table I correspond to real proportions. The study received 2678 complete responses to the survey, which was greater than the required minimum of 2005.

**Table II.** French physiotherapist students' experience of the COVID-19 pandemic. Survey of French physiotherapy students, 2021

	N	Anxiety (GAD-7 score)					Depression (PHQ-9 score)					Insomnia (ISI score)				
		Normal (0-4)	Mild (5-9)	Moderate (10-14)	Severe (15-21)	p-value	Normal (0-4)	Mild (5-9)	Moderate (10-14)	Severe (15-21)	p-value	Normal (0-7)	Subthreshold (8-14)	Moderate (15-21)	Severe (22-28)	p-value
Total	2,678	852	918	465	401	-	876	898	462	239	99	1,422	1,021	455	80	-
Sex						<0.01										<0.01
Female	1,843	500	641	350	324		531	649	331	183	68	718	743	322	60	
Male	835	352	277	115	77		345	249	131	56	31	404	278	133	20	
Age						<0.01										<0.01
< 21 years	1,375	491	463	224	172		495	457	226	101	34	615	531	200	29	
> 21 years	1,303	361	455	241	229		381	441	236	138	65	507	490	255	51	
Training year						<0.01										<0.01
Second	595	231	208	86	56		238	174	104	41	13	277	221	84	13	
Third	698	248	232	104	103		236	238	109	62	26	320	240	118	20	
Fourth	694	202	237	141	107		198	265	125	59	21	267	286	119	22	
Fifth	691	171	241	134	135		204	221	124	77	39	258	274	134	25	
Repeating						0.22										0.002
Yes	332	89	116	66	50		94	104	61	39	17	110	136	72	14	
No	2,330	758	797	395	349		779	788	397	199	80	1006	880	378	66	
Live alone						<0.01										<0.01
Yes	952	266	330	169	170		270	310	181	98	55	360	386	168	38	
No	1,726	586	588	296	231		606	588	281	141	44	762	635	287	42	
Psychiatric history						<0.01										<0.01
Yes	511	65	168	131	143		70	151	132	84	49	117	213	148	33	
No	2,167	787	750	334	258		806	747	330	155	50	1005	808	307	47	
At risk of COVID-19						<0.01										<0.01*
Yes	167	37	55	37	37		31	55	34	28	12	9	61	45	52	
No	2,511	815	863	428	364		845	843	428	211	87	71	960	410	1,070	
Lockdown (March 2020) <sup>y</sup>						<0.01										<0.01
Yes	2,105	225	204	74	58		639	727	368	203	88	848	812	379	66	
No	573	627	714	391	343		237	171	94	36	11	274	209	76	14	
Tobacco and/or alcohol consumption						<0.01										<0.01
Yes	215	46	70	47	45		38	73	4	3	18	66	81	57	11	
No	2,463	806	848	418	356		838	825	413	209	81	1,056	940	398	69	

Missing data due to unanswered questions in the questionnaire are not presented in the table. A sensitivity analysis was performed for each of the variables with missing data by assigning 1 or the other of the modalities of these variables.

\*For this test, a Fisher's exact test was performed, given that the conditions of validity for a  $\chi^2$  test were not met.

<sup>y</sup>In the context of the COVID-19 pandemic, universities and higher education establishments were closed by Ministerial ordinance during a period in France. However, not all French physiotherapy students were still in their physiotherapy studies at the time of the lockdown, since the survey questionnaire was administered a year later, and derogations were in force for health students who helped during the crisis, depending on the year, in clinical services. Modality: moderately.

**Table III.** Impact of the COVID-19 pandemic on French physiotherapist students' training. Survey of French physiotherapy students, 2021

	N	Access to tutorials during lockdown in November 2020 (ref.: "Yes")			Greater workload (ref.: "Same or lesser")			Perception of training affected by the crisis (ref.: "No or slightly")					
		OR (IC 95%)	p-value	aOR (IC 95%)	OR (IC 95%)	p-value	aOR (IC 95%)	OR (IC 95%)	p-value	aOR (IC 95%)			
Training year													
Second	595	1		1	1		1	1		1		1	
Third	698	1.74 (1.20, 2.56)	0.0004	1.83 (1.25, 2.74)	1.12 (0.90, 1.40)	0.293	1.03 (0.82, 1.29)	3.18 (2.35, 4.36)	<0.001	3.10 (2.25, 4.31)	<0.001	3.10 (2.25, 4.31)	<0.001
Fourth	694	2.30 (1.61, 3.35)	<0.001	1.94 (1.26, 3.01)	1.56 (1.25, 1.95)	<0.001	1.43 (1.09, 1.86)	2.05 (1.55, 2.72)	<0.001	2.03 (1.43, 2.89)	<0.001	2.03 (1.43, 2.89)	<0.001
Fifth	691	1.29 (0.87, 1.93)	0.206	0.97 (0.59, 1.61)	1.42 (1.14, 1.77)	0.002	1.31 (0.97, 1.78)	2.25 (1.69, 2.99)	<0.001	2.14 (1.43, 3.20)	<0.001	2.14 (1.43, 3.20)	<0.001

Adjusted for age, sex, living alone, depression, anxiety, and insomnia. aOR: adjusted odds ratio.

Mental health status differed significantly according to age, sex, training year, psychiatric history, and tobacco use/alcohol consumption.

Of the female students, 36.5% presented moderate to severe anxiety, compared with 23% of male students. Among students who reported severe anxiety, 57.1% were over 21 years old, while they represented 42.4% of students who did not report anxiety. Furthermore, almost 18% of physiotherapy students who lived alone reported severe anxiety, compared with 13% of students who did not live alone.

### Secondary outcomes

**Physiotherapy training during the COVID-19 pandemic period.** Seventy-five percent of French physiotherapy students did not treat any COVID-19 patients, and 62% considered themselves ill-prepared or insufficiently trained to treat COVID-19 patients in rehabilitation.

In addition, 84% of French physiotherapy students believed that the quality of their physiotherapy studies decreased during the COVID-19 period. With respect to COVID-19, 29.0% of students thought they were not provided with sufficient means to protect themselves against the virus, while 62.1% felt that their physiotherapy school did not provide adequate training on how to treat COVID-19 patients.

When adjusted for age, sex, depression, anxiety, and insomnia, third-year students were more likely to perceive an increase in their workload than second-year students. Furthermore, third- and fourth-year students found access to tutorials to be more complicated than second-year students (Table III). For instance, third-year students were 3 times more likely than second-year students to respond that the health crisis affected their studies (OR 3.18, 95% CI 2.35, 4.36),  $p < 0.001$ ). Fourth-year (OR 2.05, 95% CI 1.55, 2.72),  $p < 0.001$ ), and fifth-year (OR 2.25, 95% CI 1.69, 2.99),  $p < 0.001$ ) students also faced similar difficulties.

**Perception of the profession and future career during the COVID-19 period.** The health crisis caused a high percentage of students (26.4%) to question their chosen profession, with 85% believing that the quality of training had decreased, despite considerable

**Table IV.** Consequences of the COVID-19 pandemic on French physiotherapist students' perceptions of the profession of physiotherapist and career plans. Survey of French physiotherapy students, 2021

N	Change of representation of the profession of physiotherapist (ref.: "No or lightly")			Increased desire to become physiotherapist (ref.: "Yes")			Change of career plan (ref.: "No")			
	OR (IC 95%)	p-value	aOR (IC 95%)	OR (IC 95%)	p-value	aOR (IC 95%)	OR (IC 95%)	p-value	aOR (IC 95%)	p-value
Sex										
Female	1		1	1		1	1		1	
Male	0.77 (0.63, 0.94)	0.01	0.86 (0.69, 1.06)	1.29 (0.98, 1.68)	0.06	1.41 (1.06, 1.86)	0.89 (0.67, 1.18)	0.4		
Age										
< 21 years	1		1	1		1	1		1	
> 21 years	1.05 (0.88, 1.26)	0.6		1.35 (1.05, 1.73)	0.02	0.81 (0.56, 1.17)	1.24 (0.96, 1.60)	0.1	1.33 (0.92, 1.94)	
Training year										
Second	1		1	1		1	1		1	
Third	1.21 (0.93, 1.58)	0.2	1.14 (0.86, 1.51)	1.31 (0.89, 1.94)	0.2	2.21 (1.42, 3.47)	1.60 (1.09, 2.37)	0.02	1.46 (0.98, 2.20)	0.06
Fourth	0.99 (0.75, 1.30)	0.9	0.92 (0.69, 1.23)	2.01 (1.38, 2.96)	<0.001	2.02 (1.21, 3.39)	1.32 (0.89, 1.97)	0.18	0.99 (0.62, 1.60)	0.98
Fifth	1.18 (0.90, 1.54)	0.2	1.00 (0.75, 1.32)	1.94 (1.33, 2.85)	<0.001		1.48 (1.00, 2.20)	0.05	0.91 (0.54, 1.53)	0.71
Live alone										
No	1		1	1		1	1		1	
Yes	1.09 (0.90, 1.31)	0.4		0.93 (0.71, 1.20)	0.6		1.09 (0.84, 1.42)	0.5		
Depression										
No	1		1	1		1	1		1	
Yes	2.27 (1.87, 2.75)	<0.001	1.43 (1.12, 1.83)	1.90 (1.46, 2.48)	<0.001	1.77 (1.26, 2.49)	1.85 (1.41, 2.40)	<0.001	0.91 (0.65, 1.28)	0.59
Anxiety										
No	1		1	1		1	1		1	
Yes	2.45 (2.02, 2.96)	<0.001	1.71 (1.34, 2.17)	1.54 (1.19, 2.00)	<0.001	1.16 (0.84, 1.61)	2.98 (2.29, 3.87)	<0.001	2.70 (1.94, 3.74)	<0.001
Insomnia										
No	1		1	1		1	1		1	
Yes	2.30 (1.86, 2.83)	<0.001	1.51 (1.19, 1.93)	1.34 (0.99, 1.81)	0.06	0.97 (0.67, 1.37)	2.14 (1.62, 2.82)	<0.001	1.44 (1.04, 2.00)	0.03
COVID-19 patients										
No	1		1	1		1	1		1	
Yes	1.40 (0.46, 0.96)	0.58		0.57 (0.10, 4.39)	0.5		0.82 (0.24, 3.80)	0.77		

aOR: adjusted odds ratio.

efforts made by all French physiotherapy schools to maintain it.

Concerning students' perception of the physiotherapy profession, 78% of French students had the same perception of the profession as before the COVID-19 period. While 69% of them still wanted to become a physiotherapist, 26.4% were afraid to continue their physiotherapy studies and feared regarding their future career. Students' reported plans concerning their future professional practice included 55% private practice, 20% salaried practice, and 25% mixed practice (see Table IV).

Participants reporting depression (aOR 1.43 (1.12, 1.83)), anxiety (aOR 1.71 (1.34, 2.17)) or insomnia (aOR 1.51 (1.19, 1.93)) were more likely to have changed their perception of the profession of physiotherapy. Among male students, the pandemic significantly decreased their desire to become physiotherapists (aOR 1.41 (1.06, 1.86)) (Table IV).

## DISCUSSION

This study found that the mental health of French students was impacted by the COVID-19 period, by their impression of undergoing a lower quality of physiotherapy training, and their doubts regarding their future careers. Overall, the study found that physiotherapy students who did not experience a lockdown reported better mental health.

With respect to anxiety, the study found that female physiotherapy students reported being generally "more anxious" than male students, as they are 4 times more likely to report experiencing severe anxiety. It is important to note that the female sex is slightly overrepresented in this study compared with the actual population, which could introduce a bias in the interpretation of this data. Age was significantly associated with anxiety, with greater levels of anxiety in older physiotherapy students (over the age of 21 years). The same was observed for the year of study. The study found that upper-year students (typically those in their final year) tended to be more anxious than students in lower years. Living alone was also associated with anxiety. These results are in line with previous studies (21, 22).

The university workload appears to have been greater as a consequence of the pandemic, particularly for fifth-year students. The fifth year is usually the most difficult year for physiotherapy students, because that is when they learn a great deal of clinical reasoning and diagnostic techniques. The most engaged students were the most anxious in this study cohort, notably as they neared their final examination (see results in Table IV).

Despite the above-mentioned effects, the COVID-19 pandemic did not cause the students in this study

to change their career plans; rather, it increased their desire to become physiotherapists. These results are consistent with those of the World Physiotherapy Organization (23), which published a briefing on the immediate impact of COVID-19 on students. In total, 3840 students enrolled in over 400 higher-education institutions (HEIs) in 52 countries participated in their survey regarding their early experiences and the consequences of COVID-19 on entry-level physiotherapist education. Most students who participated in the survey worried about their clinical placements (58%) and the effects on their future (38%).

*Physiotherapy training during the COVID-19 period.* Even before the COVID-19 period, physiotherapy students worldwide were considered a population at risk of mental health disorders, due to the frequency of depression, anxiety, and stress (24, 25). These global results are more pronounced than those obtained in Anglo-Saxon and North American countries where training is not hands-on (26, 27), and compared with medical students (28). This phenomenon can be explained by the fact that French physiotherapy training features an important manual element and strong professional education through mentoring. Therefore, the limited access to internships due to the COVID-19 lockdown was particularly crippling. As per the study published by Kota et al. (29), we might expect that second-year physiotherapy students would be affected most by the impact of COVID-19 and lockdowns. It is well known in the literature (30, 31, 32) that factors influencing physiotherapists' job satisfaction are primarily impacted by previous experience and working conditions, especially for first-year physiotherapy students (29). Surprisingly, the results of the current study revealed that fifth-year physiotherapy students were significantly more affected by the COVID-19 pandemic than second-year students. Attention should thus be focused on students in their graduation year; the further they are in their studies, the more anxious and depressed they become. We can reasonably assume that they fear the transition to professional status when they feel that they have not received the expected quality of training to ensure they have the minimum required skills. This also highlights the need to be attentive to the quality of life at work for these future professionals. This study suggests that providing COVID-19-focused training to French physiotherapy students and ensuring they have access to sufficient personal protective equipment may be important measures with the potential to decrease their levels of anxiety, depression, and insomnia, which seems logical given the context (33). These findings are similar to those related to the prevention of burnout in populations of urology (34) and surgical (21) residents. While we did not assess our population's risk of suicide during this period, due to a lack of time to obtain

consistent results, this population is known to be at risk (35, 36). Moreover, Srivastav et al. (37) observed that physiotherapy students' physical health is also affected, with a significant reduction in self-reported physical activity and energy expenditure levels during the COVID-19 lockdown period, further supporting the adverse effects of the pandemic on all aspects of the health of these students.

#### *Study strengths and limitations*

This is the first French descriptive cross-sectional study to evaluate the impact of the COVID-19 pandemic on the mental health status, training, perceptions of the physiotherapy profession, and career plans of French physiotherapy students. A high response rate was obtained, giving the study good external validity and, consequently, national generalizability of the results.

An important methodological limitation of this study is the potential for recall bias, because the first lockdown period was not evaluated. However, the first (17 March–11 May 2020) and second lockdowns (30 October–15 December 2020) were only 5 months apart. There are also certain epistemological limitations inherent to the quantitative approach used for this type of study (descriptive cross-sectional national survey). Indeed, purely quantitative approaches restrict the field of analysis and do not allow for an in-depth understanding of the behaviour of individuals. The complementary use of qualitative approaches, allowing for a broader, more complete, more global, and richer understanding of the phenomena studied, should thus be considered in the future. Considering the current study design, several other potential sources of bias should be considered. First, it cannot be excluded that there may be potential for a social desirability bias (where respondents to surveys tend to answer in a manner they feel will be seen as favourable by others) and a selection bias, given the way participants were recruited through training institutes.

#### *Conclusion*

These results show that the COVID-19 pandemic period has affected the mental health, education, perceptions of the physiotherapy profession, and career plans of French physiotherapy students, particularly for those students near the end of their studies.

Taking into account the results obtained in this national study, we propose the following recommendations: improved COVID-19 training in line with international physiotherapy recommendations (38, 39), creation of a hands-on training group, notably at the European level with the help of the European Network of Physiotherapy in Higher Education (ENPHE), a psychological monitoring team (especially for fifth-year students), public

financial assistance, and improved pedagogical monitoring for students who have dropped out of their studies.

In conclusion, the COVID-19 pandemic had a significant impact on the experiences, training, and perceptions of the physiotherapy profession, as well as the career choices of French physiotherapy students. Students in their final year of physiotherapy studies were found to be particularly emotionally vulnerable, requiring support during their professional transition, such as specialized training, financial assistance, and monitoring. This impact was especially notable among final year physiotherapy students, who experienced changes to their training, perceptions of their profession, and career plans. Overall, the experiences of these students during the pandemic highlight the need for increased support, training, and financial assistance for those experiencing mental health challenges in physiotherapy and in the healthcare field as a whole.

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Informed consent was obtained from all subjects involved in the study.

*The authors have no conflicts of interest to declare.*

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