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# Medical Student Voices on the Effect of the COVID-19 Pandemic and Motivation to Study: A Mixed-Method Qualitative Study

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**Abstract:** This study explores the impact of the COVID-19 pandemic on the motivation of medical students using a mixed-method, user-led approach with students as both participants and researchers. Data were collected in 2021 through essays describing students' motivation during the pandemic. The essays were coded, categorized, quantified, and statistically analyzed for gender-based differences. Results showed that while 71% of students reported increased motivation, female students more often experienced fluctuating motivation levels. Key motivational factors included career aspirations and educational purpose, whereas demotivational factors involved disruptions to college life and mental health struggles. Notably, female students disproportionately expressed doubts about the medical profession. The study also utilized a collaborative autoethnographic method to explore the researchers' own pandemic experiences, revealing long-term positive effects and resonating with initial findings. This research contributes to understanding the pandemic's long-term impact on medical students and offers insights into nurturing resilient future doctors capable of handling healthcare crises.

**Keywords:** COVID-19 pandemic; motivation; medical education; professionalism; mental health



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## 1. Introduction

In the context of medical education, the COVID-19 pandemic has reshaped educational practices, altered professional trajectories, and influenced personal motivations in profound ways. Students within the healthcare professions were among the most uniquely affected, finding themselves at a crossroads of an emerging healthcare crisis and their educational journey. In the Spring of 2020, our medical school made the rapid shift to online learning; students could no longer socialize with their friends and peers, access the hands-on clinical experience so vital to their medical education, and were isolated at home. From the Fall semester of the same year, our students were able to return to some in-person learning, and a hybrid (or blended learning) model has been largely adopted since then. But how was their motivation to study impacted by the pandemic experience, and what, if any, are the long-term ramifications?

Prior to the pandemic, motivation among medical students was a well-documented area of research, identified as a key determinant of academic achievement, clinical performance, and eventual professional commitment [1–3]. Motivation in medical education is complex and influenced by a myriad of factors, including personal interest, perceived relevance of the curriculum, and a sense of professional calling [1,4–7]. Motivation in

medical education is generally understood to be primarily driven by intrinsic factors such as personal interest in the medical field, the desire to help others, and the commitment to lifelong learning, as well as extrinsic factors like grades, career aspirations, and external rewards [1]. Intrinsic motivation, which refers to the internal drive to engage in an activity for its inherent satisfaction, is thought to be crucial for sustaining long-term engagement in the demanding and often stressful environment of medical training [8]. Various theoretical frameworks have been proposed in the literature to describe motivation within medical education [8–12]. Of these, self-determination theory has been put forward as a key framework for understanding the elements that nurture motivation and support both psychological well-being and healthy behavioral development [2,9,10]. In the context of medical education, self-determination theory emphasizes the importance of satisfying three core psychological needs—autonomy, competence, and relatedness—to cultivate intrinsic motivation and sustained engagement in learning [8–10]. By addressing these needs (autonomy, competence, and relatedness), medical educators can help to create a learning environment that not only enhances academic performance but also promotes overall student well-being and resilience [9,10], as a number of interventions have demonstrated [9].

However, the COVID-19 pandemic introduced a novel set of challenges and stimuli that may have significantly altered these motivational dynamics, particularly in terms of the core psychological needs of autonomy, competence, and relatedness described within self-determination theory. Previous studies from numerous countries have shown that the pandemic's impact on medical education has been both broad and deep, with immediate shifts to online learning, disruptions in clinical rotations, and increased psychological stress among students [13–17]. In the context of medical education, these changes are particularly significant, given the direct relevance of the unfolding health crisis to the students' future professions. Studies on the impact of the COVID-19 pandemic among Japanese healthcare students, in common with those of other countries, have suggested a range of effects, from increased anxiety and stress [17–19] to a heightened sense of purpose and commitment to healthcare [20–23]. For example, Tahara and colleagues, in their study of Japanese healthcare college students surveyed in the early months of the pandemic, found that about 70% had poor mental health (based on General Health Questionnaire-12 results), postulating that loneliness was a major factor [19]. Yet, despite the negative, the pandemic experience also seems to have brought an increase in students' motivation, driven by a renewed sense of the importance of their chosen career in times of crisis [20–23]. For example, Komasa and colleagues observed that, through the pandemic experience, final-year students became "strongly passionate" about becoming doctors, and they were cognoscente of what their role as a new doctor would entail [20].

In a previous study, we also observed this dual aspect of positive and negative factors influencing the study motivation of medical science students during the pandemic, but with overwhelmingly high levels of increased motivation [23]. However, our data suggested that this motivation began to wane as the pandemic measures became prolonged, especially among female students who are thought to be at particular risk of depression and mental health disorders, as demonstrated in a study from Germany [24]. A pre-pandemic study among a cohort of Japanese female medical students found that 15% experienced psychological distress [25]. Thus, it is important to take into consideration the aspect of gender when investigating the effect of the pandemic on student motivation and mental health.

Currently, in 2024, four years on from the initial school closures in Japan, the pandemic seems to be a thing of the past; students and educators have indeed adapted to a certain "new normal" when it comes to the acceptance of online and hybrid forms of teaching and the stressors caused by social distancing and fears and uncertainties over the SARS-CoV-2 virus have abated. But how do medical students and young residents currently view those pandemic years? How has that experience during those formative years shaped their motivation and career trajectory moving forward? In a separate study, in which we investigated medical students' English language learning motivation, using

data collected at pre-, mid-, and post-pandemic time points, we discovered that student's motivation had not fluctuated greatly, indicating strong resistance to the negative effects of the pandemic [26]. The aims of this study, therefore, were to examine the effect of the COVID-19 pandemic on the motivation to study medicine in a cohort of Japanese medical students, explore differences by gender, and reflect on the pandemic from a post-pandemic perspective. Utilizing data collected at the height of the pandemic in 2021 and a second body of autoethnographic data gathered in 2024; this study aims to offer a granular picture of the effect of the pandemic on medical student motivation and examine its lasting impact in reference to self-determination theory. Providing insights into the complexities and nuanced ways in which the pandemic has impacted medical students in Japan can help educators tailor teaching and curricula to suit student needs and help to futureproof their education against other such crises.

## 2. Materials and Methods

### 2.1. Study Design

This qualitative study was carried out in two stages. In the first stage, a cross-sectional quantitative content analysis [27] was performed involving a systematic coding and quantification of the participants' motivation status (increased, decreased, etc.) and the factors associated with that motivation. This method was previously used and described in our study of motivation among medical science students [23]. In the second stage, a collaborative autoethnographic approach [28–31], a type of narrative analysis, was used to retrospectively probe the researchers' own experiences of their motivation to study from a post-pandemic and post-data analysis perspective. This novel study design allows for longitudinal observations and triangulation and contextualization of the content analysis data. Collaborative autoethnography was selected as the method for the second stage of this study because it combines traditional autoethnography's introspective narrative approach with a collaborative research dynamic, allowing multiple voices and perspectives to emerge through shared reflection and dialogue. Unlike traditional ethnography, which focuses on the observation of others, autoethnography points the lens inward, enabling researchers to explore their own lived experiences. This makes it particularly suitable for studies like ours, where the researchers were also participants in the educational setting being investigated.

Importantly, both stages of this study included a user-led approach in which current and former medical students were involved in the research processes. User-led research methodology has been employed to explore aspects of mental health [32,33] and has been demonstrated to promote collaboration, empowerment, inclusivity, and relevance [34]. Involving students in research is known to be an effective pedagogical method [35]; in this instance, however, the aim was to draw from the student's lived experience to add a deeper granularity of peer-level insight into this work, essentially, to hear the students' voices.

### 2.2. Participants

The participants for the first stage of this study were a convenience sample of second-year medical students enrolled in a six-year medical degree at a large national university in Japan. At the time of data collection, the students were mostly 19 to 20 years of age. In 2021, the students were studying using both in-person and online classes. The tutorial classes in which the students discuss actual clinical cases in small teams were all held online, and hands-on hospital experiences in the Spring semester were canceled. The students were studying a 20-week compulsory medical English course taught by the first author. In this class, the students study the rudiments of clinical communication in English. In 2020, the course had been taught online, but by 2021, it had reverted to the usual classroom setting. Before being included in the analysis, informed consent was received from the students, and students were given the option to opt out of the study at any time.

Participants in the second stage of this study comprised three researchers (two female and one male), all of whom had been medical students during the pandemic. This group

included two current medical students (third- and fifth-year medical students) and one who has since graduated and is now a resident doctor at the same institution. The third-year student has taken medical classes both in-person and online since the admission in 2021. The other two researchers were on clinical rotations during the pandemic, and their hands-on experiences in the hospital were restricted on some occasions due to hospital policy.

### 2.3. Data Collection

Data were collected through an essay writing task given to the students in June 2021. Students were instructed to write an essay of 250–300 words or more on how they felt as medical students during the COVID-19 pandemic and how it affected their motivation to study medicine. The essay task was distributed and returned via Google Forms. The essays of students who gave their informed consent were included in the analysis. The essay task was conducted as part of the students' coursework, so it did not impose any additional burden on their time.

In the second stage, the three researchers who had participated in the content analyses individually composed short essays (approximately 500 words) in which they reflected upon their personal experiences of their medical studies during the COVID-19 pandemic and how it affected their motivation. Looking retrospectively at their experiences, the students were also encouraged to use the narratives of the students from the content analysis as a lens through which to reflect upon their own experiences. Collaborative reflections, discussions, and analysis among the researchers promoted deeper exploration and comparison of their individual experiences, adding a layer of peer-level insight that might be lacking in studies focused solely on external data collection, while the narrative analysis facilitated a more holistic understanding of motivation changes and provided a bridge between the numeric content analysis and the human experience behind those numbers. Furthermore, this second stage allowed for longitudinal observation as the researchers reflected on their experiences both during and after the pandemic. This retrospective approach enabled them to consider how their motivations evolved over time, which was essential for contextualizing the quantitative findings from the first stage. To mitigate potential biases inherent in reflecting on one's own experiences, we structured the autoethnographic process to encourage critical reflection, asking the researchers to use the narratives from the content analysis as a comparative lens. This encouraged them to move beyond their subjective views and consider their experiences in light of broader trends observed among their peers.

### 2.4. Data Analyses

For the first stage of the study—the quantitative content analysis—the students' essays were anonymized and tagged with identification numbers and notes specifying each participant's gender to facilitate subgroup analysis. Three members of the research team independently reviewed the essays using established content analysis methods [27,36–38], focusing on assessing the students' motivational status (e.g., increased or decreased) and identifying key statements related to the factors influencing their motivation. The initial process was conducted inductively; the researchers first read through the essays to identify recurring themes and patterns and then assigned preliminary coding labels to each motivational or demotivational factor observed. The researchers first sought to identify patterns and similarities in the ideas expressed in the essays and assigned coding labels to each individual motivational or demotivational factor. To ensure consistency in the coding, the first author consolidated the findings from the initial essay review, synthesizing them into a comprehensive set of coding labels with accompanying descriptions. These codes were designed to capture both the details of individual motivational states and the broader contextual factors impacting them. For validation, the essays were then independently coded by the three researchers using the finalized coding scheme, and the results were recorded in Microsoft Excel for Mac software Version 16.78 (Microsoft Corp, Redmond, Washington, U.S.). Codes were later grouped thematically and categorized following discussion among the research team.

Inter-rater reliability was assessed using Cohen's Kappa to measure the level of agreement between the three researchers. Consensus on coding was defined as reached when at least two of the three researchers assigned the same code to a given factor. This metric was used to help contextualize the coding process, demonstrating whether or not the coders are not merely in general agreement but consistently identified similar themes and factors across the essays. The number and frequency (%) of each motivational state, code, and category were calculated separately for male and female students. The chi-square test was used to assess differences in the distribution of the frequency of motivational codes between male and female students. This test determines if there is a statistically significant association between gender and the distribution of these variables. When the chi-square test assumptions were not met (e.g., smaller sample sizes), the Mann-Whitney U test was applied. This non-parametric test compares the overall distribution of ordinal variables between two independent groups, such as gender. By using these tests interchangeably, the most appropriate method was applied based on the data type. Statistical analysis was performed using SPSS version 28.0 (IBM Corporation, Tokyo, Japan).

A sub-analysis was conducted to examine the interactions and associations among the variables, with the aim of identifying any potential correlations. The twelve most recurrent motivational and demotivational codes were chosen for a quantitative assessment of their co-occurrence. The results of the sub-analysis are presented in Appendix A. For the ethnographical stage of the study, the essays written by the researchers were read and analyzed by the first author. Emergent themes were identified and compared across the essays and the results of the coding. Discussions among the authors were then carried out to probe the themes and clarify any misinterpretations. Reflections on specific themes brought up in the discussion sessions were then written by the authors. Again, in an effort to mitigate potential bias, the thematic analysis was conducted collaboratively, with the first author leading the initial analysis of the essays and the other researchers involved in subsequent discussions to probe and refine emerging themes. This collective analysis reduced the risk of individual bias and ensured that diverse perspectives were considered. Discrepancies in interpretation were openly discussed, helping to clarify potential misinterpretations and reinforcing the credibility of the findings.

### 2.5. Ethical Statement

The study, approved by the Ethics Committee of the University of Tsukuba, Institute of Medicine (approval number: 1872), was conducted according to the guidelines of the Declaration of Helsinki.

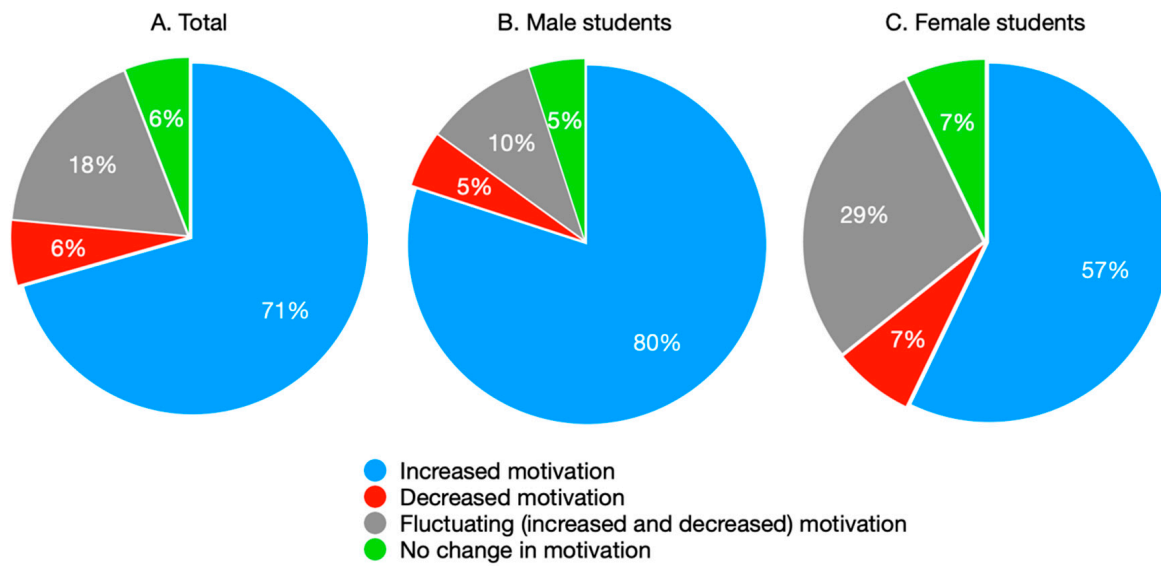
## 3. Results

Essays were collected from 46 students. One student withheld consent to participate in the study, and the essays of the remaining 45 (29 male and 16 female students) consenting participants were included in the content analysis. Following independent coding of the essays, the average inter-rater reliability (IRR) across all coding categories and between all pairs of researchers, calculated using Cohen's Kappa, was 0.534, indicating a moderate level of agreement.

### 3.1. Motivation Status

Of the 34 students who gave clear answers about their motivation status, about two-thirds ( $n = 23$ ; 71%) attested to increased motivation, while only two said that their motivation had decreased. Seven students expressed having fluctuating (experiencing increased and decreased) motivation, and two experienced no change. Figure 1A–C shows the total results and compares them by sex. A higher percentage of male students (80%) reported increased motivation than female students (57%), while a larger percentage of female students (female = 29%, male 10%) reported experiencing fluctuating (increasing and decreasing) motivation to a degree that approached statistical significance ( $p = 0.107$ ). This section may be divided by subheadings. It should provide a concise and precise description

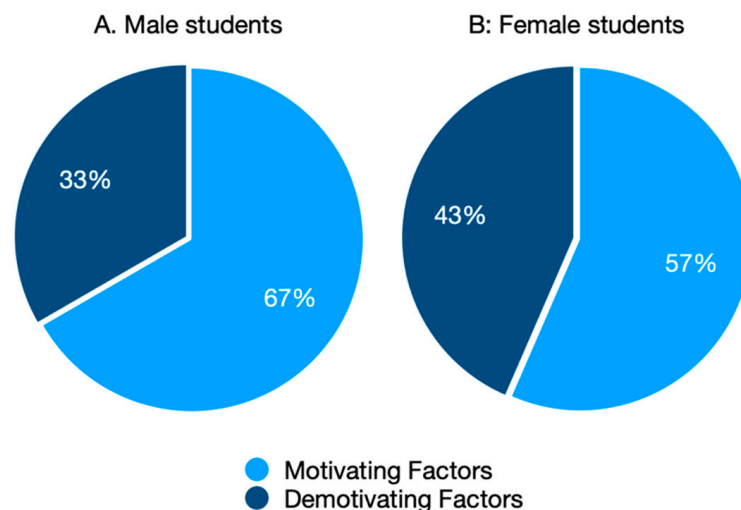
of the experimental results, their interpretation, and the experimental conclusions that can be drawn.



**Figure 1.** Medical student motivation to study during the COVID-19 pandemic.

3.2. Coding Analysis

The consensus among the researchers who conducted the coding analysis of the 45 essays revealed 138 motivational statements and 83 demotivational statements, which were divided across 26 codes representing motivational factors and 11 codes representing demotivational factors. After discussion among the research group, the codes were then grouped thematically into eight motivational categories and three demotivational categories. Figure 2 shows the proportions (%) of motivational to demotivational statements comparing male and female students. The figure shows that female students had a larger proportion of demotivational statements than male students.



**Figure 2.** Comparison of the number of coded motivational and demotivational statements by sex.

3.2.1. Coding Analysis of Motivational Factors

The categorized results of the coding analysis for the motivational factors, including explanations of the codes and example sentences from the students' essays, are presented in Table 1, and more detailed information is presented in Table S1. The most frequently occurring (over 14% of respondents) motivation factor codes were: Value of Studies

(*n* = 18; 40.0%), Save (*n* = 14; 31.1%), Heroes (*n* = 12; 26.7%), Importance of Medicine (*n* = 10; 22.2%), Truth (*n* = 8; 17.8%), In-person (*n* = 7; 15.6%), and Link (*n* = 7; 15.6%). In men, the most frequent code was Value of Studies (*n* = 12; 41.4%), while in women, Save was the most frequent code (*n* = 8; 50.0%). The code Value of Studies represents statements where the medical students describe how the pandemic gave them a renewed sense of purpose as they realized the relevance of their studies in combating health crises. Their sense of the importance of acquiring the necessary knowledge and skills to contribute effectively in future pandemics or health challenges was amplified by their experience of the pandemic. The code Save is representative of statements where the students describe the altruistic desire to help and save lives, especially during the global health crisis, which seems to have been a powerful motivator, particularly for female students. Their studies took on new meaning as they realized that their future roles as doctors could have a direct and significant impact on saving lives. Thematic categorization of the codes revealed that for both male and female students, the key themes were those connected to the students' chosen vocation in medicine, namely, Career Aspirations (*n* = 30; 66.7%), Educational Purpose (*n* = 28; 62.2%), Motivation through Media and Observation (*n* = 22; 48.9%), Helping Others and Global Impact (*n* = 16; 35.6%), and Knowledge and Information (*n* = 14; 31.1%). Of secondary importance were the more social- or personal-related categories of Education and Learning Environment (*n* = 17; 37.8%), Self-Preservation and Health Awareness (*n* = 6; 13.3%), and Social and Emotional Connections (*n* = 5; 11.1%).

**Table 1.** Coding analysis results of medical study motivational factors.

Category	Code, Explanation, Example Statement	Male <i>n</i> (%)	Female <i>n</i> (%)	Total <i>n</i> (%)	<i>p</i> -Value (Effect Size)
Career Aspirations	Importance of Medicine: Realized the value of medicine: "The spread of the coronavirus has reminded me of the importance of medicine".	5 (17.2)	5 (31.3)	10 (22.2)	0.279 (0.448)
	Good Doctor: Want to be a good doctor: "This situation makes me more motivated to study medicine. I want to study medicine more, work as a good doctor, and help many people in need".	4 (13.8)	2 (12.5)	6 (13.3)	0.516 (0.370)
	Contribute: Hope to contribute to medicine, drug or vaccine development in the future: "This corona has strengthened my desire to contribute to people as a medical worker or researcher, and has motivated me to study medicine".	2 (6.9)	4 (25.0)	6 (13.3)	0.091 (0.544)
	Determined: COVID made me more determined to become a medical doctor: "After COVID-19, I have a strong feeling that I should be a medical professional".	3 (10.3)	0 (0)	3 (6.7)	0.258 (0.456)
	Rewarding: Doctor's job is rewarding: "Doctors' job is a rewarding job. I want to get to feel rewarding in my working, so the [pandemic] situation gives me some motivation".	2 (6.9)	0 (0)	2 (4.4)	0.410 (0.403)
	Grow: Grow as a person, medical worker, doctor: "I would like to study at this university so that I can grow as a person as well as medical knowledge".	1 (3.4)	0 (0)	1 (2.2)	0.590 (0.346)
	Shortage: Shortage of medical workers, healthcare system problems: "COVID-19 especially had a big impact on the medical setting. Even though medical supplies, beds, and human resources were not enough, doctors and nurses had to work to treat patients".	1 (3.4)	0 (0)	1 (2.2)	0.644 (0.328)
	Vision: Can visualize the work of a medical doctor/vision for the future: "COVID-19 gave me an even clearer purpose of studying medical science and the image of the ideal doctor".	1 (3.4)	0 (0)	1 (2.2)	0.644 (0.328)
Category total:		19 (65.5)	11 (68.8)	30 (66.7)	0.328 <sup>§</sup> (0.651)

Table 1. Cont.

Category	Code, Explanation, Example Statement	Male n (%)	Female n (%)	Total n (%)	p-Value (Effect Size)
Educational Purpose	Value of Studies: Saw the value, meaning, importance, duty of medical studies: "I began to realize that, as a medical student, I had the responsibility to acquire knowledge about the current medical care situation and think about what we can do right now as students".	12 (41.4)	6 (37.5)	18 (40)	0.799 (0.262)
	Link: Saw a link between pandemic and my studies: "As we learned more about the virus, we were motivated to learn more about medicine. Actually, experiencing a viral epidemic made me understand why viruses are so dangerous".	6 (20.7)	1 (6.3)	7 (15.6)	0.202 (0.480)
	Opportunity: I have more chances to study medicine than other people as a medical student: "I'm medical student and have an opportunity to learn medicine in detail, so I would like to make a good use of the chance".	1 (3.4)	2 (12.5)	3 (6.7)	0.285 (0.446)
	Category total:	19 (65.5)	9 (56.3)	28 (62.2)	0.700 § (0.349)
Motivation through Media and Observation	Heroes: Impressed by the courage and hard work of health care workers: "When I see on TV that doctors in the field are risking their lives to deal with corona, I feel a strong desire to become a full-fledged doctor and fight COVID-19"	7 (24.1)	5 (31.3)	12 (26.7)	0.610 (0.339)
	Media Good: Watching the news, TV about COVID, medical field: "As a result of this pandemic, medical care has been covered more and more in the mass media, and I have become more interested in medical care than ever before".	5 (17.2)	1 (6.3)	6 (13.3)	0.408 (0.404)
	Innovation: Impressed by advances in medicine, vaccines: "Recently, the vaccine was made and taken. From my perspective, this is great job of researchers. I am impressed their effort and hope that we can overcome COVID-19".	3 (10.3)	1 (6.3)	4 (8.9)	0.592 (0.345)
	Category total:	15 (51.7)	7 (43.8)	22 (48.9)	0.700 § (0.349)
Education and Learning Environment	In-person: More face-to-face classes, in-person activities has increased motivation: "Now, I am more motivated to study medicine. We had our second semester class face to face and I was able to make friends and study with them".	3 (10.3)	4 (25)	7 (15.6)	0.191 (0.485)
	Online Good: Online classes are good: "The pandemic has given me a flexible environment for studying, with a great help of the university staff and lecturers. Due to enhancement of online system, students could learn from streamed video which was useful for revision, leading to a better understanding".	3 (10.3)	2 (12.5)	5 (11.1)	0.715 (0.301)
	Time: Had time to reflect on my future, study more, more free time: "I think my motivation for studying has increased because I have more free time".	2 (6.9)	1 (6.3)	3 (6.7)	0.715 (0.301)
	Encouraged: When I saw my friends studying hard, I was encouraged: "My motivation to study has been more motivated by classmates because they are so excellent that I always feel that I should study hard to catch up with them".	0 (0)	2 (12.5)	2 (4.4)	0.121 (0.339)
Category total:	8 (27.6)	9 (56.3)	17 (37.8)	0.147 § (0.775)	
Helping Others and Global Impact	Save: Protect, help, benefit, save lives, people, the world, patients, healthcare workers: "I want to help many people working at medical setting, but I cannot do anything for COVID-19 patients. In order to help many patients in the future, I should study medicine hard now".	6 (20.7)	8 (50)	14 (31.1)	0.042 * (0.569)
	Developing Countries: Help people in poor, developing countries, address disparities in medical care: "I was shocked by the terrible disparity with areas where medical care was not available. Medical care must be something that people can receive "equally" and "fairly". I think it is necessary to solve these problems in the future".	1 (3.4)	1 (6.3)	2 (4.4)	0.590 (0.346)
	Category total:	7 (24.1)	9 (56.3)	16 (35.6)	0.078 (0.965)
Knowledge and Information	Truth: Importance of having, collecting, disseminating correct information, knowledge: "Learning a lot of medical knowledge, I can become to judge whether a medical news is true or false. It is essential to pick the true information up and decide our behavior by ourselves".	6 (20.7)	2 (12.5)	8 (17.8)	0.516 (0.370)
	Scientific Interest: Pandemic made me interested in medical science, virology, infection biology, new research fields: "Through the COVID-19 pandemic, I want to study virology and immunology".	5 (17.2)	1 (6.3)	6 (13.3)	0.292 (0.443)
	Category total:	11 (37.9)	3 (18.8)	14 (31.1)	0.372 § (0.415)



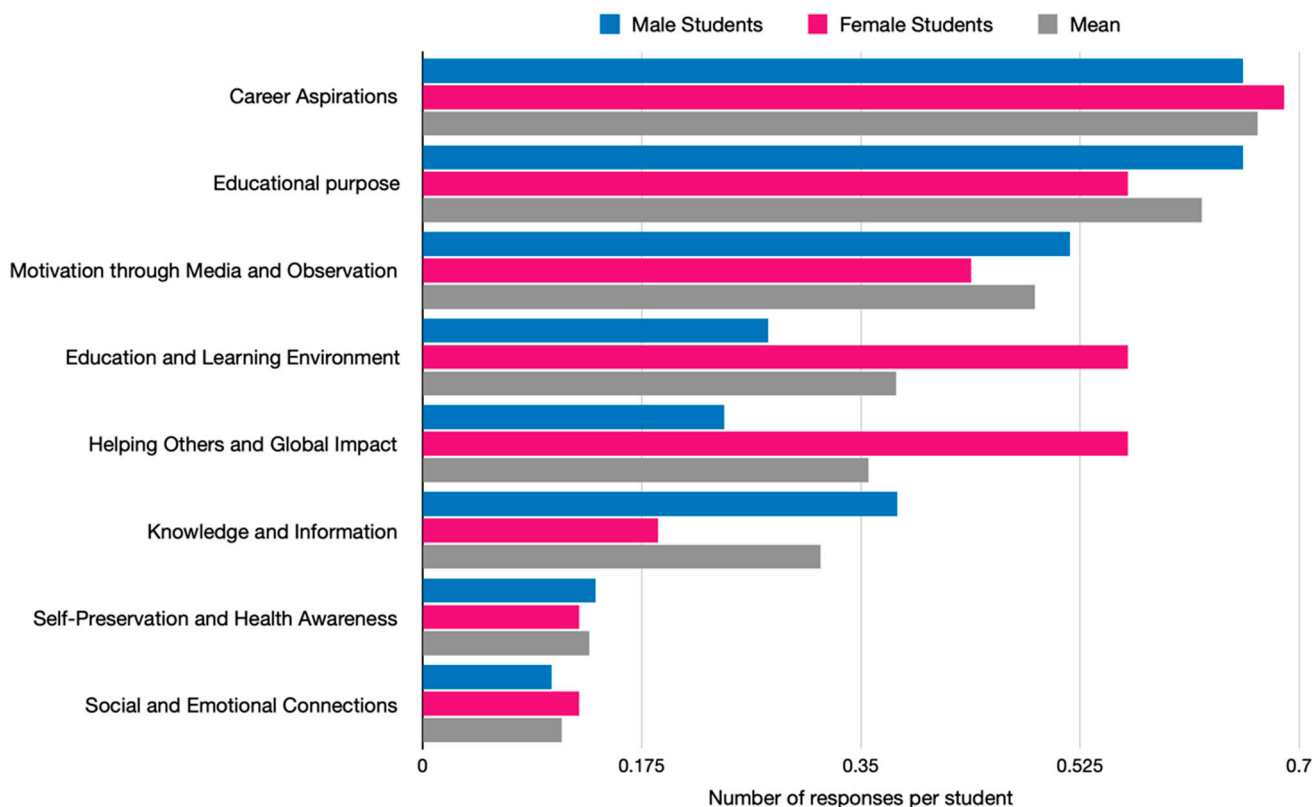
Table 1. Cont.

Category	Code, Explanation, Example Statement	Male n (%)	Female n (%)	Total n (%)	p-Value (Effect Size)
Self-Preservation and Health Awareness	Protection: Realized the importance of protecting myself, doing what I can to curb the pandemic: "I hope that the COVID-19 pandemic will be over by the time I start working as a doctor, but there is a great possibility that another infectious disease will spread. I think I need to learn well now so that I can protect myself and work for the patients in such a situation".	4 (13.8)	1 (6.3)	5 (11.1)	0.408 (0.404)
	Life: Realized the importance of life, health: "The pandemic has had a positive impact on my motivation mainly because it made me realize that health is the core of our social life".	0 (0)	1 (6.3)	1 (2.2)	0.356 (0.421)
	Category total:	4 (13.8)	2 (12.5)	6 (13.3)	0.903 § (0.176)
Social and Emotional Connections	Communication: Realized the importance of communicating, interaction, relationships with friends: "Thanks to the environment in which we are forced to take what is called "social distance," I can experience first-hand the importance of being with and interacting with others".	1 (3.4)	2 (12.5)	3 (6.7)	0.285 (0.446)
	New Friends: I could make other friends because of the pandemic: "COVID-19 helped me to have wide and deep relationship with my friends".	2 (6.9)	0 (0)	2 (4.4)	0.410 (0.403)
	Category total:	3 (10.3)	2 (12.5)	5 (11.1)	0.826 § (0.246)

Notes. Chi-squared test was used for statistical analysis unless otherwise indicated; § = Mann-Whitney U Test; \* = Indicates statistically significant p-values.

Figure 3 shows the proportion (shown as number of responses per student) of coded statements for each motivation category, with separate bars to represent the mean values and those for male and female students. Noteworthy differences between male and female students are the higher proportion of responses for male students in the Knowledge and Information category (male = 37.9%; female = 18.8%) and for female students in the Education and Learning Environment (male = 27.6%; female = 56.3%) and the Helping Others and Global Impact categories (male = 24.1%; female = 56.3%). With regard to the Knowledge and Information category, proportions of both codes within this category, Truth (male = 20.7%; female = 12.5%) and Scientific Interest (male = 12.2%; female = 6.3%) were substantially higher for male students. With regard to this category, the code Truth was used to represent statements where students describe how the pandemic made them more aware of the critical need for accurate information in medicine and public health and more conscious of the role they would play in ensuring the dissemination of reliable, evidence-based information. In this quest for truth, the code Scientific Interest describes how the pandemic sparked a newfound interest in specific areas of medical science, such as virology, immunology, and infection biology. Many students seem to have been inspired to explore these fields further, potentially influencing their future career paths.

In the Education and Learning Environment category, female students had substantially larger proportions of responses in the codes of In-person (male = 10.3%; female = 25.0%) and Encouraged (male = 0%; female = 12.5%), which are both associated with an increase in motivation after a return to in-person classes following a semester of online learning and being encouraged by working alongside their peers. Face-to-face interactions provided much-needed peer support, and the in-person academic environment played a critical role in motivating students. Watching their classmates work hard and succeed provided encouragement and a healthy sense of competition that pushed them to do their best and gave them access to the much anticipated hands-on learning experiences that are critical for their growth as medical professionals. A statistically significant difference was observed in the Helping Others and Global Impact category, where the code of Save was of a substantially higher proportion among female students (male = 20.7%; female = 50%;  $p = 0.042$ ).



**Figure 3.** The proportion of categorized coded statements representing motivational factors.

### 3.2.2. Coding Analysis of Demotivational Factors

The categorized results of the coding analysis for the demotivational factors are presented in Table 2, and more detailed information is presented in Table S2. The most frequently occurring (over 14% of respondents) demotivational factor codes were: Robbed ( $n = 20$ ; 44.4%), Lonely ( $n = 12$ ; 26.7%), Negative emotions ( $n = 12$ ; 26.7%), and Experiments and Practicum ( $n = 9$ ; 20%) and Difficult Profession ( $n = 8$ ; 17.8%). In men, the most frequent code was Robbed ( $n = 14$ ; 48.3%), while in women, Experiments and Practicum was the most frequent code ( $n = 7$ ; 43.8%). The code Robbed represents statements in which the medical students expressed a deep sense of loss, as the pandemic denied them the traditional college experience they had envisioned. The cancellation of events, restrictions on social interactions, and inability to participate in extracurricular activities such as clubs left them feeling as though they had been deprived of an essential part of their education. For some, this loss translated directly into decreased motivation to study, as the collegiate experience felt incomplete and disheartening. The code Experiments and Practicum was used to describe the loss of a critical aspect of medical education, i.e., the hands-on experience gained through practical training and laboratory experiments. For many students, particularly females, the cancellation of these essential components due to the pandemic was deeply demotivating. The lack of practical experience was seen as a significant gap in their education, leading to frustration and a decrease in motivation. Categorization revealed that for both male and female students, the main demotivational theme was Disruption of College Life and Social Experiences ( $n = 46$ ; 102.2%), followed by Emotional and Mental Health Struggles ( $n = 21$ ; 46.7%) and Doubts and Uncertainties About Medical Profession ( $n = 16$ ; 35.6%).

**Table 2.** Coding analysis results of medical study demotivational factors.

Category	Code, Explanation, Example Statement	Male n (%)	Female n (%)	Total n (%)	p-Value (Effect Size)
Disruption of College Life and Social Experiences	Robbed: COVID robbed me of my college life, events, experiences, club activities: "I think that the COVID-19 pandemic has robbed me of the college life I envisioned and deprived me of my motivation to study".	14 (48.3)	6 (37.5)	20 (44.4)	0.486 (0.379)
	Lonely: Cannot meet friends and family, can't talk with people, cannot make friends: "The complete isolation, to some extent, made me feel lonely making it harder to maintain my mental health".	7 (24.1)	5 (31.3)	12 (26.7)	0.606 (0.341)
	Experiments and Practicum: Could not develop skills (experimental, practical, communication etc.): "Some of the practical training specific to medical school was cancelled. For example, those held in hospitals. This led to a decrease in our motivation. In addition, instead of doing this practical training, we were shown videos and made to write reports on the training we did not do, which was just painful. Also, in the practicals where we had to do experiments, we were given only the data to discuss without actually doing the experiments".	2 (6.9)	7 (43.8)	9 (20)	0.006 * (0.702)
	Online Bad: Online classes and studying at home were bad, demotivating, lack of in-person class interaction: "I think I lost a little bit of motivation in the online classes".	3 (10.3)	2 (12.5)	5 (11.1)	0.592 (0.345)
	Category total:	26 (89.7)	20 (125)	46 (102.2)	0.486 § (0.523)
Emotional and Mental Health Struggles	Negative Emotion: I feel anxious, depressed, melancholy, fear, stress, painful, fear: "I have never experienced such a life-threatening pandemic before, so I feel very scared".	7 (24.1)	5 (31.3)	12 (26.7)	0.606 (0.341)
	Helpless: I felt helpless and frustrated as a medical student: "The COVID19 crisis once made me less motivated to study because it seemed to me that there is nothing we can do to cure seriously ill patients and improve the situation. I felt that it is helpless and there is no meaning to study hard".	2 (6.9)	4 (25)	6 (13.3)	0.107 (0.532)
	Media Bad: Watching the news made me anxious: "When I first heard about the pandemic through the media, I was taken aback and scared. The media mentioned the threatening situation our country's medical care system is facing and the risks healthcare workers are taking".	1 (3.4)	1 (6.3)	2 (4.4)	0.590 (0.346)
	Mask: Wearing a mask is hard: "The fact that I have to wear a mask all the time is also stressful for me".	1 (3.4)	0 (0)	1 (2.2)	0.644 (0.328)
	Category total:	11 (37.9)	10 (62.5)	21 (46.7)	0.686 § (0.361)
Doubts and Uncertainties About Medical Profession	Difficult Profession: I found a doctor is a difficult profession: "Healthcare workers including doctors have to take care of infected patients. In fact, it is a risky job. I became anxious about my life as a doctor. Possibly, I may be transferred illness in the hospital. I realized difficulty of working as a health care worker".	2 (6.9)	6 (37.5)	8 (17.8)	0.017 * (0.649)
	Limitations: I became aware of the limitations of medicine, medical science: "I felt that the threat of infectious diseases is very real. At the same time, by being exposed to the threat of infectious diseases, I became aware of the powerlessness of human beings and the limitations of medical science".	2 (6.9)	3 (18.8)	5 (11.1)	0.233 (0.466)
	Discrimination: Experienced, witnessed discrimination, criticism of healthcare workers, medical students: "I heard the news that some healthcare workers left their hospitals because of harmful rumors or hard schedule. They are working so hard for people suffering from illness and pain, however, at the same time, the same people damage them, not appreciating for their hard working".	2 (6.9)	1 (6.3)	3 (6.7)	0.715 (0.301)
	Category total:	6 (20.7)	10 (62.5)	16 (35.6)	0.062 *§ (1.005)

Notes. Chi-squared test was used for statistical analysis unless otherwise indicated; § = Mann-Whitney U Test; \* = Indicates statistically significant p-values.

Figure 4 shows the proportion (shown as number of responses per student) of coded statements for each demotivation category, again with separate bars to represent the mean values and those for male and female students. Female students had a larger proportion of demotivational statements compared to male students across all three categories. The largest difference can be observed in the Doubts and Uncertainties About Medical Profes-

sion category ( $p = 0.062$ ; male = 20.7%; female = 62.5%), with the code of Difficult Profession being particularly distinct and showing statistically significant difference between male and female students ( $p = 0.017$ ; male = 6.9%; female = 37.5%). The code Difficult Profession represents statements in which the students described how the pandemic made them aware of the inherent risks and difficulties of being a healthcare worker. The realization that doctors and other healthcare professionals were facing life-threatening risks, working under extreme pressure, and sometimes facing public criticism led some students to question their ability to handle the demands of the profession, which appears to have introduced doubts and anxieties about their future careers. Within the category of Disruption of College Life and Social Experiences, which was high for both male and female students, the code of Experiments and Practicum was of a notably higher proportion for female students and showed a strong statistical difference ( $p = 0.006$ ; male = 6.9%; female = 43.8%).



**Figure 4.** The proportion of categorized coded statements representing demotivational factors.

### 3.3. Collaborative Autoethnography Results

Three researchers who participated in the coding analysis took part in the collaborative autoethnography part of this study. In this process, the students wrote essays reflecting on their experience of medical education during the pandemic, and they did so with reference to the data from the coding analysis presented above. The autoethnographic essays that were written in February 2024 are presented in unedited form in Appendix B. After being read by the first author, five key themes were identified: Impact on Education, Loneliness and Isolation, Career Reflection, Resilience and Adaptability, and Positive Outcomes. Table 3 shows the five themes with an explanation for each theme and an accompanying example passage from the autoethnographic essays to illustrate the theme.

**Table 3.** Key themes that emerged from the autoethnographic essays on medical education during the pandemic.

Theme	Explanation	Example Sentences from the Essays
Impact on Education	All three essays discuss the significant impact of the COVID-19 pandemic on education. They mention shifts to online learning, cancellations of hands-on experiences, and disruptions to the usual academic routines	“All classes, including new student orientation, shifted online, and hands-on hospital experiences were canceled. The continuation of the pandemic, which had already influenced my high school experience, left me feeling deprived of numerous opportunities”. (Appendix B.1)
Loneliness and Isolation	Each essay touches upon feelings of loneliness and isolation experienced by the authors during the pandemic, such as absence of classmates, solitude leading to introspection, and empathy towards others’ anxiety and loneliness	“I had a harder time focusing on online lectures without having my classmates nearby to have a little side conversation with. It was quite lonely”. (Appendix B.2)

**Table 3.** *Cont.*

Theme	Explanation	Example Sentences from the Essays
Career Reflection	The essays reflect on the authors’ career aspirations and how the pandemic influenced their perceptions of their chosen paths. They discuss gaining clarity about their goals and motivations, as well as discovering alternative career paths related to healthcare beyond traditional medical practice.	“I realized that there were a variety of career paths to save people’s lives, such as basic medical scientists and social welfare researchers. Through media, I not only learned about the serious situations around the world but also witnessed the achievements in vaccine development and the critical role of public health systems. These revelations helped me clarify what I wanted to learn for 6 years of medical school”. (Appendix B.1)
Resilience and Adaptability	Despite the challenges presented by the pandemic, all three authors demonstrate resilience and adaptability in their responses. They find ways to cope with the changes, whether through introspection, seeking out new opportunities, or finding solace in outdoor activities.	“As a healthy 22-year-old, it forced me to adapt to unforeseen circumstances, building resilience for future uncertainties. While some classmates reported feeling lost or demotivated, the pandemic became, for me, a catalyst for self-discovery”. (Appendix B.3)
Positive Outcomes	Despite the difficulties, each essay also highlights positive outcomes or lessons learned from the pandemic experience. These include increased motivation to pursue medicine, appreciation for the importance of accurate information, and deeper understanding of the role of healthcare workers.	“It was inspiring seeing the hard work of medical workers. However, the main message I got from the media was that medicine isn’t perfect and you need to be prepared to become a doctor. This sense of danger increased my motivation for studying. It led me to recognize that studying is a must, but I also needed to grow as a person to become a true doctor”. (Appendix B.2)

**4. Discussion**

*4.1. Medical Student Motivation during COVID-19*

While the experience of the COVID-19 pandemic—its effect on educational practice, its impact on social life, and the uncertainty and fear that it brought—was no doubt detrimental to the many aspects of medical education and student life [13,14,39–41], for our population of medical students, it seems to have had a positive impact on their motivation to study overall with 71% attesting to increased motivation to study (Figure 1). This finding, while perhaps divergent from the majority of studies in this field, was similar to that of our earlier study of medical science students (studying to become hospital laboratory technicians or researchers) [23] and some other studies involving populations of students in the health sciences [42–44]. From the perspective of self-determination theory, the increase in motivation could be explained by the satisfaction of the core psychological needs of competence and relatedness. Despite the challenges posed by the pandemic, many students arguably felt an increased sense of competence as they recognized the critical role of healthcare professionals in addressing the crisis. Relatedness, or the connection to the broader healthcare community and the societal need for medical expertise, may have fueled their intrinsic motivation to contribute meaningfully through their studies.

The collaborative autoethnographic essays revealed a difference in motivation status between the three students. During our discussions, a number of suggestions were put forward, gender difference being prominent; however, another highly plausible explanation suggested by the students was the year of study at the time of school closure, with the lockdown disrupting their educational experience in different ways dependent on the curriculum for the year group. In coding analysis essays, event cancellations and lack of practical experience left students feeling deprived of essential learning opportunities. An

autoethnography by a student who started medical school during the pandemic highlighted the longing for clinical rotations missed due to the crisis (Appendix B.2). Conversely, for senior students already burdened with tests and clerkships, the pandemic perhaps offered a respite for introspection (Appendix B.3). They appreciated the chance to consider their educational path and future options away from the usual pressures. The lack of hands-on experiences was deeply felt, yet the mix of online learning and limited face-to-face interactions provided a balanced approach, facilitating both reflection and application. This finding is supported by a study by Metakides and colleagues, who investigated differences in burnout and motivation levels of Cypriot medical students over the pandemic, revealing significant differences in burnout and motivation levels between the six years of medical students, with motivation being the highest in years one and four, and lowest in years five and six [45]. Similarly, variations in depression and anxiety levels by year of study were found in a large-scale study of Indonesian medical students [36]. Future research is warranted to elucidate the interplay between academic year, gender, and other factors that influence motivation in medical students.

#### 4.2. Demotivational Factors

In the coding data, the category of Disruption of College Life and Social Experiences was particularly critical as a demotivational factor for both male and female students. Many students expressed feeling a sense of loss, or being deprived or “robbed”, with regards to their college life (Table 2 and Table S2). This sense of being robbed of student life was also echoed in our research with medical science students [23], and several other studies have pointed to this having a negative impact on student motivation [18,46]. Gadi and colleagues, who studied a cohort of students in healthcare-related fields in the United Kingdom, made the very same observation: “The restrictive measures imposed on healthcare students owing to the threat of COVID-19 have robbed many of the joys of university life” [46,47]. In their study, they find both positive and negative impacts of the pandemic on student life; however, alongside mental health, anxiety, and depression issues, among the more concerning are negative changes in lifestyle habits, including reduced physical activity and a worsening of diet [46]. A similar result was demonstrated in another study on Japanese medical students [18].

For female students in our study population, the fact that online learning denied access to typical hands-on learning was a strongly significant demotivational factor (Table 2 and Table S2). This reflects the importance of satisfying the need for competence as outlined by self-determination theory; the inability to engage in hands-on learning limited their opportunity to develop and demonstrate competence, which possibly undermined their intrinsic motivation. This finding suggests the critical role that campus life, peer interactions, and practical hands-on experiences play in medical training. The limited exposure to hands-on experiences due to COVID-19-related restrictions may have stunted the development of professionalism in team medicine. In their essays, some students mentioned the fact that they could not participate in the Early Exposure Program, which is incorporated into the first-year curriculum at the university where this research took place. As part of this formative experience, students act as outpatient escorts, following patients through their hospital visits to gain a patient-centered perspective of the healthcare system as the patient interacts with various medical professionals. The early program also helps students to understand interprofessional and patient-doctor relations—the importance of working as a team—and, thereby, implement a sense of professionalism. The swift pivot to online learning, while perhaps necessary, highlighted gaps in delivering comprehensive medical education remotely, particularly in replicating clinical and laboratory experiences (such as the Early Exposure Program), a situation discussed in various studies [13,46,48–50].

It also became apparent that loneliness was a key demotivational factor for both male and female students (Tables 2 and S2). Indeed, the results of our sub-analysis investigating the interaction between the codes showed that feeling “robbed” of one’s college life was strongly associated with feelings of loneliness. One female student expressed her emotions at this time in this way: “The complete isolation, to some extent, made me feel lonely, making it harder to maintain my mental health.” In the autoethnographic essays, the students describe how the lockdown and changes in educational delivery also exacerbated feelings of loneliness and isolation among students as traditional social interactions and support networks became inaccessible (Appendix B). The effects of loneliness and isolation during the pandemic have been the subject of numerous studies [46,51–53]. Zheng and colleagues’ study of 1260 Chinese medical students also demonstrated the negative impact of mental stress and loneliness on future career choices [53]. The lack of social connection and peer support during the lockdown may have weakened students’ motivation by making them feel isolated and disconnected from their academic and social communities.

Connected to the factor of loneliness, another prominent category to emerge from the data was Emotional and Mental Health Struggles, with students experiencing increased stress, anxiety, isolation, and a sense of helplessness due to the pandemic’s uncertainties and the abrupt changes to their education and personal lives (Tables 2 and S2). This period has shown the paramount importance of mental health support for medical students, indicating that medical institutions must prioritize accessible, robust mental health services and develop a culture that encourages seeking help, an assertion that is echoed throughout recent studies on this topic [15–19,46,51–53]. Furthermore, in our data, the category Doubts and Uncertainties About the Medical Profession also emerged as an important demotivational factor, a trend seen more prominently among female students. These doubts appear to have arisen from first-hand observations of healthcare workers’ challenges during the pandemic, from tough working conditions, risk of disease, and even discrimination. Specifically, the coding label of Difficult Profession revealed how the pandemic experience led, in some instances, to re-evaluations of career choices (Tables 2 and S2). Results from other studies of medical and nursing students reveal similar observations [54–58]. A study of French medical students, for example, showed that the pandemic had caused 17% to question their ability to become doctors and a further 12% to reconsider specialty choice, with a significant propensity for female students [54]. The COVID-19 pandemic may have prompted medical schools to better equip students with the realities of the profession, including the inherent risks and ethical challenges.

#### 4.3. Motivational Factors

The two categories of Career Aspirations and Educational Purpose are the most represented within our coding data, and they suggest a strong connection between individuals’ career aspirations and their educational experiences over this pandemic period. For the students, the pandemic appears to have reemphasized the importance of studying medicine and spurred the determination to make contributions to medicine by becoming “good” physicians (Tables 1 and S1). Simultaneously, the pandemic helped them to recognize the value of their studies, see how they connect with what they are studying in the classroom, and understand what an opportunity (or responsibility) they have as medical students and future physicians. In the subanalysis, the most frequently interacting factor was the Value of Studies, and its association with the code Importance of Medicine was among the strongest observed. These findings were also in agreement with our previous study involving medical science students [23] and some other publications [59,60]. One study among Chinese medical students training to be pediatricians, for example, reported that the COVID-19 pandemic had bolstered 66.7% of the students’ decisions to become “good pediatricians” [60]. In the autoethnographic essays, the authors also reflected on career aspirations, noting how the pandemic induced a period of introspection and clarity regarding personal goals and motivations. For one author, this period of reflection led to the recognition of alternative career paths within the healthcare sector beyond traditional

medical practice, thereby broadening the authors' perspectives on how to contribute meaningfully to society amidst a global crisis. This was echoed in the coding data, with several students mentioning that the pandemic awakened a new interest in scientific subjects (virology, infection biology, etc.), with similar findings also present in other published studies [23,61,62].

A notable motivation among the medical students was the desire to help others and make a global impact. This altruistic drive was particularly pronounced among female students. While this altruism is known to be a primary motivator for medical students [7], the pandemic appears to have reignited or emphasized this desire [44,63]. Perhaps the most profound example of this altruistic sense was the heavy involvement of medical students who volunteered to help patients in need as part of the pandemic effort [64,65]. One way this type of motivation might be leveraged in medical school might be in educational initiatives that involve real patients, as discussed by Jha and colleagues [66].

As reflected in the student's comment above, the influence of media, personal observations of medical professionals during the COVID-19 pandemic, and the advances in medical technology (such as vaccine development) had an influence on almost half the study population. Indeed, healthcare professionals play a significant part as role models to inspire and motivate medical students [67]. In the autoethnographic essays, one student also expressed how the media had influenced her: "Through media, I not only learned about the serious situations around the world but also witnessed the achievements in vaccine development and the critical role of public health systems. These revelations helped me clarify what I wanted to learn for 6 years of medical school". These findings, perhaps, suggest a need for more accurate and inspiring representations of medical careers within the medical school curriculum, showcasing the variety and depth of roles within the healthcare sector. Medical education institutions might consider tailoring their programs to highlight the diverse career paths within medicine, thereby catering to a broader range of aspirations and motivating a more diverse group of students to pursue medical careers. While instilling a sense of professionalism in medical students is a vital part of medical education [68–71], the impact of the pandemic on this important aspect of medical education has been documented in some studies [21,59]. Byram and colleagues suggest that the pandemic presented an opportunity for professional identity formation; in their coding analysis, they revealed that the medical students viewed doctors as "altruistic, effective communicators, and pledged to be like them in the future" [59].

The COVID-19 pandemic has also led to a heightened appreciation for medical knowledge and awareness of health issues among the general public. Interestingly, medical students often found themselves being sought out by friends and family for advice on medical issues. Connected to this, the pandemic also made the students aware of the importance of having and disseminating "correct" information. Students appear to be aware of the issue of mis- or dis-information and see themselves as having a responsibility to discern between accurate and inaccurate information. These observations emphasize the importance of equipping students with the ability to think critically, to appraise and assess sources of information, to give them the desire to keep abreast of the latest updates in their field, and also the ability to distill and communicate that information with the general population [72,73]. The pandemic, thus, appears to have helped instill the importance of practicing evidence-based medicine among medical students and further reinforced self-determination theory's need for competence, as these students were given opportunities to apply their knowledge in real-world settings.

What emerged as a consistent feature of the three autoethnographic essays, however, were the interconnected themes of resilience and adaptability. Despite the adversity, the authors described a process of adaptation and growth, leveraging the situation as a catalyst for self-discovery and personal development. Resilience and adaptability are desired traits of medical doctors, too, and proved so during the COVID-19 pandemic [14,74,75]. Responding to situations in which one is in a crisis is, arguably, part of everyday hospital life; thus, for medical students, the pandemic has, perhaps, helped to develop these



essential character attributes. Indeed, the autoethnographic essays all indicate positive outcomes derived from the pandemic experience. These include a heightened motivation to pursue careers in medicine, a greater appreciation for the role of accurate information, and a deeper understanding of the dedication exhibited by healthcare workers. The combined narrative of the three essays suggests that, through confronting and overcoming the challenges presented by the pandemic, individuals can extract valuable lessons and insights, contributing to their personal and professional growth.

#### *4.4. Gender Differences in Medical Student Motivation*

Some variations in motivation status were experienced by our medical students during the COVID-19 pandemic according to gender; a higher percentage of male students attested to increased motivation than female students, while more female students reported changing motivation, i.e., fluctuating between increased and decreased motivation. This is similar to our previous study in which the proportion of female students reporting decreased motivation in the second year of the pandemic was higher than male students [23]. These results, although hypothesis-generating at this point, indicate that female students may have been more emotionally susceptible to the negative impacts of the pandemic than male students. Furthermore, the findings from this study revealed notable gender-based differences in the motivational and demotivational factors. Female students appeared to be more intrinsically motivated by altruistic goals, such as contributing to medicine and helping others and placed greater emphasis on the importance of medicine in the context of the pandemic. Our findings, in this regard, are in line with observations on gender differences in the motivation of medical education made by Kusurkar and colleagues in their 2011 review [2]. In the literature, female students were more likely “oriented towards altruistic motives” than males, reporting that the desire to help people was a major factor in choosing a career in medicine [2]. A study of Swiss medical students found that female medical students tended to score higher on expressive traits that reflect “socially desirable, communal traits such as helpfulness, relationship consciousness, and empathy” [76]. In contrast, male students tended to score higher for extrinsic career motivation, driven by factors such as success, prestige, and financial income [76]. Likewise, in our study, male students appeared to be more extrinsically motivated by external factors such as media coverage and the rewarding nature of the medical profession. On the demotivational side, female students were disproportionately affected by the disruption of practical training, which may reflect the greater importance they place on hands-on learning experiences. Additionally, female students expressed more doubts about the medical profession, citing the difficulty and risks associated with becoming a healthcare worker during the pandemic. Male students, on the other hand, were more affected by the perceived loss of college life but were less likely to express doubts about their future careers. These findings suggest that while both male and female students were similarly motivated by their commitment to their studies and the courage of healthcare workers, female students experienced more practical and emotional challenges related to disruptions in their education and career uncertainties, which may have long-term implications for their engagement and retention in the field.

The susceptibility of female medical students to depression and mental health disorders [24,25], touched upon in the introduction of this study, appears to have been exacerbated by the COVID-19 pandemic [44,54,77–79]. In an Italian study of 8177 medical students, for example, 12.8% reported experiencing symptoms of depression, 25.6% had anxiety, 8.7% suffered from insomnia, and 10.6% exhibited impulsive behaviors, with these conditions being more prevalent in female students [77]. Similarly, a cross-sectional study of Spanish physical therapy students revealed that, compared to their male counterparts, female respondents showed worse outcomes across various health measures, including depressive symptoms, anxiety and stress levels, sleep quality, and loneliness [78]. Evidence suggests that women and younger people, in general, were at higher risk of worse mental health outcomes during the pandemic [80–83]. One systematic review revealed that de-

pression and anxiety among medical students (especially females) during the COVID-19 pandemic were more prevalent compared to the general population and even healthcare workers [84]. In the literature, numerous suggestions have been put forward as to why female medical students should be more vulnerable to depression and anxiety than their male counterparts during COVID-19. For example, Jai et al. suggest that differences in physiological and psychological factors might make females more inclined to express their concerns and emotions openly [84]. Others maintain that female students tend to internalize stress more than males, making them more vulnerable to internalizing disorders like depression and anxiety [85]. A study of Greek medical students pointed to the association between worsening sleep quality and mental health outcomes during the pandemic and found that female students exhibited significantly higher levels of sleep disturbances and insomnia coupled with depression and anxiety [86]. Taking the various studies into consideration along with our findings, it appears that female medical students were more affected by the stringency of the lockdowns, online learning, and other restrictions, which became a perfect storm for exacerbating heightened feelings of loneliness, anxiety, doubts about the healthcare profession, and depression, and that negatively affected dietary and exercise habits, alcohol use [87], and sleep quality [86,88].

#### *4.5. Educational Environment and Implications for Medical Curricula*

The coding data and autoethnographic essays both highlight significant disruption to the educational system, sudden shifts to online learning, the cancellation of practical experiences, and the overall upheaval of academic routines. This transition not only altered educational delivery but also exacerbated feelings of loneliness and isolation among students as traditional social interactions and support networks became inaccessible. The learning environment, both physical and digital, was a critical factor in shaping students' motivations. The student's inability to have hands-on experience or perform the typical laboratory experiments was a demotivational factor, and the return to in-person classes was an important factor for many students in increasing their study motivation. Interestingly, while approximately 11% of students stated directly that online classes were bad, another 11% said that online classes were good. Collectively, the data suggest that the transition to online learning, necessitated by the pandemic, has revealed both challenges and opportunities in medical education, a finding echoed by the majority of the literature on this topic, as, for example, discussed in a systematic review by Khamees and colleagues [89]. Online lectures presented many advantages over traditional in-class teaching, which, in Japan, is often very traditional lecture-based in nature. Students enjoyed the flexibility that on-demand lectures offered in terms of the ability to control when they watched the lecture, pause the lecture, and rewatch parts they could not understand (Table S1). In the wake of the pandemic, much has been written about online learning for medical education (e.g., [39,89]), and great strides have been made toward enhancing digital platforms to simulate hands-on experiences and stimulate interactive learning, including innovative augmented reality [90] and telesimulation [91] solutions. Such efforts by medical and technology experts have combined to help ensure that the quality of education and student motivation can remain high, regardless of the delivery method.

The findings of this study offer some insights into how medical education curricula could be adapted to better support students during times of crisis. The emphasis on social and emotional connections, including the role of family, friends, and mentors, suggests that encouraging strong community ties within medical schools is vital for maintaining student motivation and mental health. To build resilient and adaptable curricula, medical schools should prioritize the development of peer support networks, mentorship programs, and collaborative learning environments. These initiatives can enhance not only academic success but also emotional well-being, as students who feel connected to their peers and mentors are more likely to persist through challenging times. Furthermore, gender-sensitive interventions are particularly important; female medical students, who were more vulnerable to stress and mental health challenges during the pandemic, would benefit from

curricula that include targeted mental health resources, stress management workshops, strong female role models, and flexible learning options. Incorporating wellness modules that address both the academic and emotional needs of students and providing mental health first-aid training, mindfulness, and meditation can better equip students to cope with crises in the future [92–94].

Our study, along with many others, indicates the negative impact of lockdowns on mental well-being, particularly for medical students. As described above, extended periods of isolation, the disruption of in-person learning, and reduced opportunities for face-to-face interactions significantly exacerbated stress, anxiety, and depression in medical students. The absence of physical presence in classrooms, clinical settings, and peer groups deprived students of the vital social connections and emotional support that are crucial for their well-being and sense of academic camaraderie on their journey through medical school. It is now clear that in-person interactions are essential for maintaining a sense of community, building motivation, and supporting mental health during times of crisis. While technology and online platforms served as stopgap measures, allowing students to stay connected remotely, these solutions often fall short as substitutes for the benefits of in-person interactions. Medical education curricula must prioritize the in-person learning environments, recognizing that human interaction is not only integral to mental health but also critical for developing the practical skills, empathy, and teamwork necessary for future healthcare professionals. Moving forward, medical schools should strike a balance by incorporating flexible online digital learning tools while ensuring that the core of education remains grounded in personal connections and face-to-face collaboration [95,96]. This blended approach will better prepare students to handle future uncertainties with the resilience and emotional support that come from strong educational communities. By proactively addressing these needs within the curriculum, medical schools can create a more adaptable, supportive educational framework that promotes both academic excellence and mental health resilience during future global challenges.

#### 4.6. Limitations

The present study has several limitations. Firstly, it involves a relatively small cohort from a singular institution in Japan. Thus, caution is warranted when attempting to apply the study's findings to different contexts. Secondly, the analysis relies on qualitative data derived largely from subjective, self-reported essays and not quantitative data. Integrating more objective measures like test scores or employing standardized questionnaires could enrich our results. Thirdly, an inherent issue with our approach is the potential for social desirability bias, where students might have been inclined to minimize negative perceptions in their essays. Moreover, the task of essay writing in English, a non-native language for the students, could introduce another layer of bias. Nonetheless, the consistent response patterns across the group may suggest that such biases were not significantly influential. Finally, our analyses did not render a clear picture of the long-term effects of the pandemic on students' professional identity formation, which is an important topic to be explored in future research.

#### 5. Conclusions

In conclusion, the juxtaposition of motivational drivers, such as career aspirations, educational purposes, and the desire to help others, against the backdrop of demotivational factors, like disruptions to college life, mental health struggles, and professional uncertainties, illustrates the complex emotional and educational challenges that medical students navigated during the pandemic period. Interpreted through the lens of self-determination theory, the satisfaction—or lack thereof—of students' needs for autonomy, competence, and relatedness played a significant role in shaping their motivation during this time. Furthermore, the gender differences observed in motivational factors suggest that while there is a shared drive among all individuals to pursue medical careers, the nuances of these motivations can vary significantly. Tailoring educational and support initiatives to

acknowledge and address these differences may lead to more effective educational outcomes. The longitudinal reflections offered by the collaborative ethnography study indicate that the lasting effect of the COVID-19 pandemic on medical education and the students who experienced the school closures was not all negative; indeed, it has helped to build character attributes such as resilience and adaptability and opened new doors of interest and strengthened professional identity.

The findings from this study offer valuable insights for medical education policy-makers, curriculum designers, and educators, suggesting a need for a holistic approach to medical education that would involve the enhancement of online and practical learning experiences to maintain student engagement, motivation, and skill development, and implementing robust mental health support systems to address the emotional toll of medical school (exacerbated by the pandemic), and stimulating open discussions about the realities of the medical profession to prepare students for the challenges ahead. This approach should not only prepare students for the technical demands of their future careers but also nurture the diverse motivations that inspire individuals to join the medical profession. By doing so, the medical education system can ensure the cultivation of a motivated, resilient, and diverse healthcare workforce capable of meeting the challenges of future global health crises.

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/covid4090105/s1>, Table S1: Motivational factors: codes, expanded descriptions, and quotations; Table S2: Demotivational factors: codes, expanded descriptions, and quotations.

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**Institutional Review Board Statement:** The study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of the University of Tsukuba, Institute of Medicine (approval number: 1872; date: 19 May 2023).

**Informed Consent Statement:** Informed consent was obtained from all participants involved in the study.

**Data Availability Statement:** Data can be obtained from the authors of the study upon reasonable request.

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## Appendix A

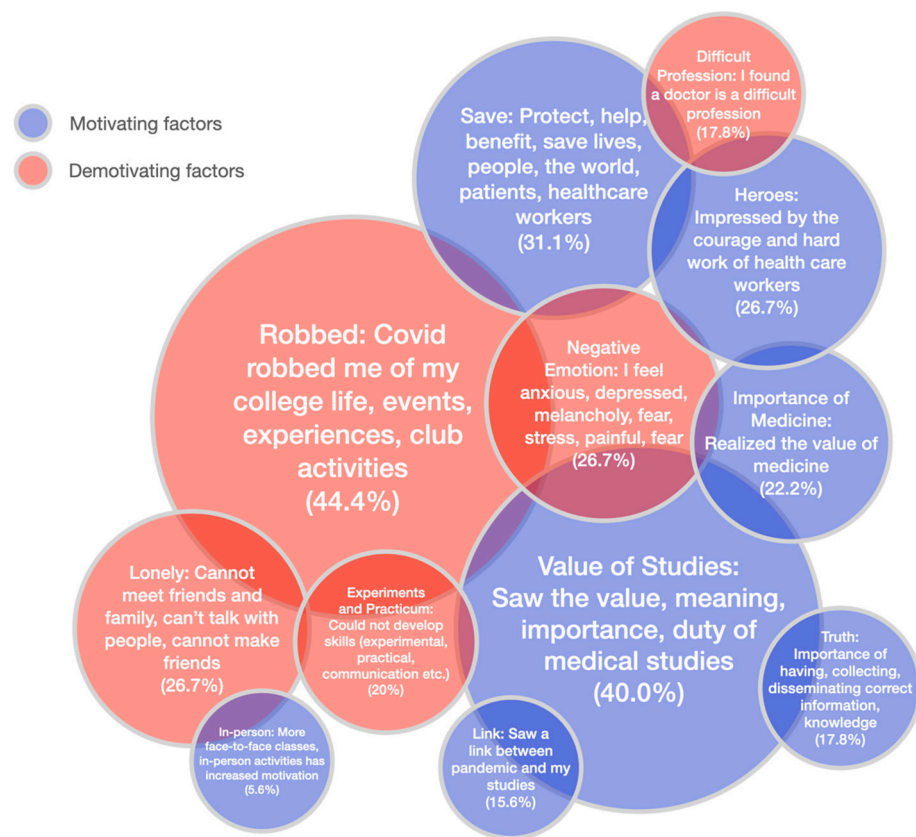
### *Appendix A.1. Results of the Sub-Analysis of the Interactions and Associations between the Factors*

A sub-analysis of the 12 most frequently occurring motivational and demotivational codes was carried out to examine the interactions between these particular factors. Counts were made of the number of times each pair of these codes were present within an essay. The results of this analysis (shown in Table 3) revealed that Value of Studies most frequently ( $n = 50$ ), Robbed ( $n = 41$ ), Save ( $n = 41$ ), and Heroes ( $n = 38$ ) were often associated with other factors.

**Table A1.** Subanalysis of interactions between the most frequently occurring motivational and demotivational codes.

Heroes	Total: 38												
Truth	3	Total: 22											
Save	7	2	Total: 40										
In-Person	1	1	3	Total: 20									
Link	3	1	2	1	Total: 19								
Value of Studies	4	7	5	1	4	Total: 50							
Importance of Medicine	5	2	4	1	0	7	Total: 32						
Robbed	3	2	5	2	3	4	3	Total: 41					
Negative Emotions	4	0	2	2	1	6	5	6	Total: 35				
Lonely	1	1	2	4	2	4	1	7	4	Total: 32			
Experiments and Practicum	1	2	3	3	1	4	2	5	3	5	Total: 31		
Difficult Profession	6	1	5	1	1	4	2	1	2	1	1	Total: 25	
	Heroes	Truth	Save	In-Person	Link	Value of Studies	Importance of Medicine	Robbed	Negative Emotions	Lonely	Experiments and Practicum	Difficult Profession	

The bubble diagram in Figure A1 is a representation of the interactions between these 12 most frequently occurring codes. The size of each bubble represents the frequency of the code, while the placement of the bubbles attempts to illustrate the interactions between the different motivational and demotivational codes based on the findings shown in Table 3.



**Figure A1.** Bubble diagram representing the frequencies and interactions of factors pertaining to medical student’s motivation to study during the COVID-19 pandemic.

**Appendix B.**

*Appendix B.1.*

When the COVID-19 pandemic started in 2020, I was a high school student, and I could not anticipate how profoundly it would impact my life. Despite the limitations on activities during high school, I maintained an optimistic outlook, hoping that the situation would improve and I could fully embrace university life. However, when I enrolled in my university in 2021, the reality remained unchanged. All classes, including new student orientation, shifted online, and hands-on hospital experiences were canceled. The continuation of the pandemic, which had already influenced my high school experience, left me feeling deprived of numerous opportunities. Yet, in retrospect, the pandemic offered unexpected insights. Especially as a student who spent freshman year during the pandemic, I realized that there were a variety of career paths to save people’s lives, such as basic medical scientists and social welfare researchers. Through media, I not only learned about the serious situations around the world but also witnessed the achievements in vaccine development and the critical role of public health systems. These revelations helped me clarify what I wanted to learn for 6 years of medical school.

Upon reading other students’ essays, I empathized with their anxiety and loneliness. Given the situation that the medical workers were exposed to the risk of infection and were unable to return to their homes at that time, medical students must have felt anxious about their future, and this anxiety was conveyed in their essays. On the other hand, it was impressive to me that many students mentioned the importance of accessing accurate information. Some of them wrote that, as medical students, they wanted to help their families and friends gain proper knowledge about COVID-19. Overall, I realized that the pandemic seriously affected the mental health of medical students but also had positive effects on their motivation to learn medicine.

Compared to 2021, I believe more students now consider the effects of the pandemic in more positive ways. It has brought several benefits to our school lives. For example, we continue to use online systems in some classes, which enables us to ask questions easily via chat and collaborate more effectively with classmates. Additionally, the pandemic has sparked an active desire to learn medicine. Last year, more students participated in voluntary practice at local hospitals than ever before. We eagerly anticipate clinical rotations in hospitals we could not experience during the pandemic. In the long run, our involvement in this crisis has deepened our understanding of the crucial role played by medical workers, further fueling our motivation.

#### *Appendix B.2.*

I had just completed my first year of medical school and had gone back to my parent's place in the U.S. when the COVID-19 pandemic started. I remember quickly packing my suitcases to get back to Japan before restrictions were going to start. When I arrived back in the university's dormitory, it felt empty. For the first two months, I enjoyed the new lifestyle, using the home as a time to start on new things such as studying English, cooking, etc. However, sometimes, a week would pass by without talking to anyone, just watching the recorded online lectures. As others have mentioned, being able to review recorded online lectures was extremely helpful. However, I had a harder time focusing on online lectures without having my classmates nearby to have a little side conversation with. It was quite lonely. COVID-19 led me to realize the importance of communication, and it gave me the courage to interact with others. I started joining Zoom seminars to make new friends, and once the restrictions loosened, I took part in volunteer activities to interact with people of various backgrounds.

Like some students expressed in their essays, I also felt the obligation as a medical student to be careful with my activity to help prevent the spread of the disease. Even though I desperately wanted to go to my grandparents' place so as not to be alone, I could not. As time passed by, being a medical student started to become a burden. I would see news of universities being heavily criticized when clusters broke out among medical students. The university sent us many warnings and placed a stronger restriction on medical club activities. I felt that medical students, especially, were deprived of their college experience. For example, many students were disappointed in not being able to do the early exposure program at the hospital. I was in the last year to fully experience it. Reflecting now, being able to see the real hospital setting and talking to patients was a very stimulating experience that increased my desire to become a good doctor. It is a disappointment that they were unable to experience it.

I realized that many students were able to obtain motivation to become doctors by watching the media featuring the hard work of doctors during the COVID-19 era. It was inspiring to see the hard work of medical workers. However, the main message I received from the media was that medicine is not perfect, and you need to be prepared to become a doctor. This sense of danger increased my motivation for studying. It led me to recognize that studying is a must, but I also needed to grow as a person to become a true doctor. Personally, watching the rise in the number of people infected and dying on the news increased my anxiety. It is hard to just express the impact of media as positive or negative. Media affected me in a negative way mentally but had a positive impact on my motivation, like many others.

It was an interesting experience reading about others' experiences of COVID-19 and reflecting upon it after 3 years. It also helped me to internalize my experience with COVID-19.

#### *Appendix B.3.*

While many students report the COVID-19 pandemic as a time of missed connections, depression, and disrupted learning, my experience took a slightly different path. Initially, like others, I underestimated the pandemic's severity, even traveling before its true impact

unfolded. But as the news hit, reality shifted, and so did my education. Classes and rotations moved online, and while I initially welcomed the focused studying, something essential started to fade: the connection with my peers.

Unlike some accounts I read, where students mentioned loneliness, this solitude led to an unexpected benefit for me: introspection. Away from the usual hustle, I found myself reflecting on my future path. While the pandemic was undoubtedly challenging, it offered a unique pause, a chance to reassess my priorities.

What surprised me was that not many others shared this introspective journey. While social distancing brought isolation for many, the essays revealed a surprising number felt more loneliness and distress than I expected. Thankfully, unlike some countries, Japan did not have a strict lockdown, allowing me a semblance of normalcy. Early mornings found me running and cycling through deserted streets, moments of quiet amidst the chaos. The sadness of the pandemic was undeniable, but these quiet times gave me time for reflection.

Unlike others who found motivation in witnessing medical professionals fight COVID-19, my goal of becoming the best possible surgeon remained unchanged. My desire to help as many people as I possibly could had always been present, and while the pandemic impacted my life, it did not alter my core aspiration.

When clinical rotations resumed, I believe many felt a widespread relief. The absence of hands-on experiences had weighed heavily on many, a sentiment I understood. However, for me, the blend of online learning and face-to-face interactions felt almost perfect, allowing both reflection and practical application. Reading the essays, I realized I might be more optimistic than I thought, perhaps explaining my lower stress levels during the pandemic.

Looking back, despite the challenges and sadness, the pandemic became a significant chapter in my life. As a healthy 22-year-old, it forced me to adapt to unforeseen circumstances, building resilience for future uncertainties. While some classmates reported feeling lost or demotivated, the pandemic became, for me, a catalyst for self-discovery. The solitude brought introspection, the challenges-built resilience, and the experience as a whole made me a more adaptable and reflective future doctor.

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