

## Research Article

### The mental health of ab-initio pilots during the COVID-19 pandemic

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#### **ABSTRACT**

The novel coronavirus disease- 2019 (COVID-19) is a major health crisis that has affected several nations and the life of millions to date. The aim of this study is to examine the impact of COVID-19 on student pilots. To the best of the authors' knowledge, no study has been performed on the effect of COVID-19 pandemic on the mental status of ab-initio pilots. As a cross-sectional study, a self-administered 48-item survey was conducted among ab-initio pilots. A total of 108 ab-initio pilots completed the survey. The Depression, Anxiety and Stress Scale - 21 (DASS-21) was used to assess the mental health of the ab-initio pilots. Independent-samples t-test and one-way ANOVA were performed to explore contributing factors associated with the presence of depression, stress and anxiety. Based on the findings, 24% of the ab-initio pilots had anxiety on varying levels. 44.2% of the participants were depressed. Varying levels of stress were detected in 45% of the ab-initio pilots. Vulnerability, working conditions, isolation, social and mass media and the lack of job opportunities were factors associated with stress, anxiety and depression among the ab-initio pilots. This study showed that depression, anxiety and stress were prevalent among the ab-initio pilots who were included in the study, and the participants were adversely affected by the COVID-19 pandemic. The mental health of ab-initio pilots needs the urgent attention of aviation authorities and experts. This study contributes to the current literature on the impacts of the COVID-19 pandemic and may make noteworthy contributions to aviation safety.

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#### **Authorship contribution statement for Contributor Roles Taxonomy**

**Bilal Kılıç:** Writing - original draft, Investigation, Supervision and Writing – review & editing, **Melis Tabak:** Writing – review & editing, Investigation.

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## 1. Introduction

On 11 March 2020, the novel coronavirus (COVID-19) was officially declared a global pandemic by the World Health Organization (WHO) [1]. The pandemic has had a devastating effect on people’s livelihoods, their health, and the economy [2]. It had also adversely affected the global economy and public mental health [3]. Furthermore, the COVID-19 outbreak has had a significant impact on the education system in the world [4]. To control the spread of the novel coronavirus - 2019 (SARS-CoV-2), universities, schools and colleges had been closed in 107 countries by March 18, 2020 [5]. Distance learning was implemented as a solution throughout the COVID-19 pandemic lockdown period [3]. The COVID-19 pandemic has had a devastating impact on the aviation industry [6]. The aviation market all around the world has experienced a substantial loss of traffic within a short period. A number of airlines completely ceased their operations and filed for bankruptcy (Table I) [7]. Moreover, airline crews have been on various furlough schemes such as unpaid leave and part-time employment as a result of the diminished demand in air transportation [8].

**Table 1.** Airlines filed for bankruptcy due to pandemic [9].

Airline	Servicing Date	Bankruptcy Application Date	Fleet Size
Flybe	1979	2020.03.05	63
Miami Air International	1990	2020.03.24	6
Trans States Airlines	1982	2020.04.01	45
Compass Airlines	2007	2020.04.05	56
Ravn Air	1948	2020.04.05	73
Braathens Regional Airlines	1976	2020.04.06	14
Germanwings	1997	2020.04.07	33
South African Airways	1934	2020.04.16	39
Virgin Australia	2000	2020.04.21	98
LGW	1980	2020.04.22	15
German Airways	1980	2020.04.22	20
Air Mauritius	1972	2020.04.23	14
Avianca	1919	2020.05.10	102
LATAM	1919	2020.05.10	315
Thai Airways	1988	2020.05.27	80
Level Europa GmbH	2017	2020.06.18	6
NokScoot	2015	2020.06.26	7
Aero Mexico	1934	2020.06.30	68
Avianca Brasil	1998	2020.07.06	10

The unprecedented burden of the severe outbreak of COVID-19 on the aviation industry has significant implications for pilot training [10]. First, flight training organizations (FTOs) and aviation schools at universities have globally ceased pilot trainings. Ab-initio pilot trainings across 40 countries worldwide have been severely affected [11]. Second, the airline industry has faced the worst crises since the September 11 attacks which gave rise to the mass unemployment of pilots [9]. Furthermore, the mental health of staff in the aviation industry might have severely deteriorated due to the unprecedented impact of the COVID-19 pandemic [12].

In the context of aviation safety, the physical state and mental state of aircrew are of great importance. The mental health status of pilots might severely affect the flight safety. It has been found that adverse mental state of pilots



jeopardized the flight safety and gave rise to unwanted situations (e.g., near-miss, incidents and accidents) [13]. It has been reported that degraded physical condition of pilots resulted in failures, errors, near-misses, incidents, and accidents [14-16]. Factors affecting ab-initio pilots' physical and mental state have been extensively studied [17-19].

The impact of the COVID-19 outbreak has been extensively investigated in various industries including healthcare [3] education [4], economy [20] and aviation [6]. Moreover, a considerable amount of literature has been published on the impact of the COVID-19 pandemic on students [21,22]. Although extensive research has been carried out on the impact of COVID-19, no single study which investigated the psychological impact of COVID-19 on ab-initio pilots exists. With this consideration in mind, we set out to analyze the psychological impact of the COVID-19 pandemic on ab-initio pilots.

## **2. Material and Methods**

### **2.1. Participants**

A 48-item survey was delivered online to 400 ab-initio pilots from four flight schools and two university-level aviation schools. The response rate was 108/400. Of the participants, 54 (50.0%) had private pilot licenses (PPL), 47 (43.5%) had ab-initio pilot licenses (SPL), and 7 (6.5%) had commercial pilot licenses (CPL). The majority (56.3%, N= 61) of the ab-initio pilots were between the ages of 17 and 23. Among the participants, 97 (89.8%) were unmarried, and 11 (10.2%) were married. Ethical approval for this study was received from the Ozyegin University Human Research Ethics Board (2021/01/05).

### **2.2. Survey**

The survey which was used in the study was developed based on two previously reported surveys [20,23]. This survey was organized into three parts. The first part was composed of 10 items questioning demographic information. In the second part, there were 17 items regarding situations related to the COVID-19 pandemic. The last part included the Depression, Anxiety and Stress Scale - 21 (DASS-21). DASS-21 contains 21 items to assess 3 emotional states (i.e., depression (items: 30,32,37,40,43,44, and 48), stress (items: 28,33,35,38,39,41, and 45), and anxiety (items:29,31,34,36,42,46, and 47) [24]. The questions in the second part had 5-point Likert-type response options (1 – strongly disagree to 5 – strongly agree). The questions in the third part (DASS-21 Scale) had 4-point Likert-type response options (1. Never – 4. Always). (Appendix)

### **2.3. Statistical analysis**

We used Kolmogorov-Smirnov test to analyze the compliance of the parameters with normal distribution. In addition to descriptive statistical methods, independent-samples t-test and one-way analysis of variance (ANOVA) were used to analyze the results of the survey on a significance level of 5%. The reliability of 17 expressions was determined by applying Cronbach's alpha analysis. The Cronbach's alpha coefficient was found to be 0.89. The reliability of 21 expressions of the DASS-21 scale was also determined. It was found to be 0.93. Factor analysis was performed to investigate the consistency.

## **3. Results and Discussion**

It was revealed that the COVID-19 pandemic had a negative impact on the psychological states of the ab-initio pilots who participated in the study. Of the participants, 24% (N=18) had anxiety on varying levels. Almost half of the participants (44.2%, N=41) stated that they were depressed. Varying levels of stress were detected in 45% of the participants.



The participants were asked, “Have you ever received psychological support during the pandemic period?” To this question, 9.3% of the participants (N=10) reported that they received psychological support during the pandemic period. Among all participants, 0.9% (N=1) requested it. Approximately one-third of the participants (9.3%, N=10) suggested that they had contact with a person who had a suspected or confirmed diagnosis of COVID-19. About one-third of the 108 participants pilots who completed the survey (37%, N=40) said they had elderly or high-risk individuals in their family.

The participants were asked whether their flight training was ceased or postponed. Almost two-thirds of the participants (63%, N=68) stated that their flight training was ceased or postponed during the pandemic period. Close to one-third of the participants (26.9%, N=29) said they had signed a cadet pilot agreement whereby the ab-initio pilot commits to serve an airline for a specified term.

Based on the results, there were no significant differences in stress and depression levels based on the participants’ age, gender, marital status, type of pilot license or status of receiving psychological support.

A significant difference was found between the male and female participants. The female participants had a higher level of anxiety than the male participants. One of the most striking results that emerged from the study was that there was no significant difference between the levels of anxiety, depression and stress of the participants who had cadet agreements and those who covered their training with their own budget ( $p > 0.05$ ).

There was a significant difference in anxiety levels based on the age groups of the participants ( $p < 0.05$ ). The number of the participants at the ages of 17-23 was higher in comparison to the number of those who were 24 or older. Flight training organizations should pay particular attention to younger pilots and plan supportive seminars, courses and organizations. Flight training departments of universities may develop a career plan for their students and graduates. Students may participate in career-related volunteer opportunities.

Female gender, being aged between 17 and 23, status of receiving psychological support during the pandemic period, items related to vulnerability (16-19), working conditions (20-22), isolation (23,24), knowledge (26) and the media (27) were factors associated with the presence of anxiety on varying levels.

School closures (e.g., FTOs and university-level aviation schools), items related to vulnerability (16-19), working conditions (20-22), isolation (23,24), lack of job opportunities (25), knowledge (26) and the media (27) were related to stress among the participants (Table 2).

The status of receiving psychological support during the pandemic period, items related to vulnerability (16-19), working conditions (20-22), isolation (23,24), lack of job opportunities (25) and the media (27) were associated with depression (Table 2).

It is well-known that the airline industry and air transport rely on keyworkers such as flight deck crew and cabin crew. Previous studies have reported that the psychological status of pilots was severely affected during mass disruptions in the past such as the September 11 attacks, the SARS epidemic, the Gulf War, and the recession in the 1990s. Therefore, the investigation of the impact of the COVID-19 pandemic on pilots, especially ab-initio pilots that are more vulnerable to stressors, is of great importance.

The findings of this study provided evidence that the COVID-19 outbreak had a significant impact on the psychological status of the ab-initio pilots who were included in the study. It was found that more than 20% of the participants had anxiety on varying levels, and more than 40% of them had different levels of stress and depression. Aviation authorities may initiate preventive actions against the negative affect of the COVID-19 pandemic on ab-initio pilots and publish recommendations for flight training organizations.

Contrary to expectations, there was no significant relationship between the participants’ statuses of having signed a cadet agreement and their levels of depression, anxiety and stress.

It is interesting to note that the most significant factor related to stress among the participants was vulnerability. This finding was directly in line with previous findings [23].



**Table 2.** The comparison of 18 items related to the COVID-19 outbreak between the groups with and without anxiety, stress, and depression

	Anxiety							Stress						Depression							
	Anxiety absent			Anxiety at any level			P.	Stress absent			Stress at any level			P.	Depression absent			Depression at any level			P.
	Med.	Min	Max	Med.	Min	Max		Med.	Min	Max	Med.	Min	Max		Med.	Min	Max	Med.	Min	Max	
<b>Health of myself/ others</b>																					
11	3	1	5	4	1	5	0.283	3	1	5	3	1	5	0.060	3	1	5	3	1	5	0.115
12	2	1	5	3	1	5	0.627	2	1	5	3	1	5	0.337	2	1	5	3	1	5	0.705
13	3	1	5	5	1	5	0.031	3	1	5	4	1	5	0.078	3	1	5	4	1	5	0.011
14	4	1	5	5	1	5	0.548	5	1	5	4	1	5	0.856	4	1	5	5	1	5	0.261
15	4	1	5	5	1	5	0.452	4	1	5	5	1	5	0.382	4	1	5	5	1	5	0.096
<b>Vulnerability</b>																					
16	3	1	5	4	1	5	0.001	2	1	5	3	1	5	<0.001	2	1	5	4	1	5	<0.001
17	2	1	4	3	1	5	0.003	2	1	4	3	1	5	<0.001	2	1	4	3	1	5	<0.001
18	2	1	4	3	1	5	0.002	1	1	4	3	1	5	<0.001	1	1	4	3	1	5	0.001
19	2	1	5	3	1	5	0.002	1	1	4	3	1	5	<0.001	1	1	4	3	1	5	<0.001
<b>Work</b>																					
20	2	1	5	4	1	5	0.002	2	1	4	3	1	5	<0.001	2	1	4	3	1	5	0.001
21	1	1	5	3	1	5	0.001	1	1	4	3	1	5	<0.001	1	1	4	3	1	5	<0.001
22	2	1	5	4	1	5	0.003	1	1	5	2	1	5	0.005	1	1	5	2	1	5	0.013
<b>Isolation</b>																					
23	1	1	3	1	1	5	0.014	1	1	2	1	1	5	0.001	1	1	2	1	1	5	0.003
24	3	1	5	4	1	5	0.042	3	1	5	3	1	5	0.031	2	1	5	3	1	5	<0.001
<b>The lack of job opportunities</b>																					
25	4	1	5	5	1	5	0.125	3	1	5	5	1	5	0.011	3	1	5	5	1	5	<0.001
<b>Knowledge</b>																					
26	2	1	4	2	1	5	0.016	1	1	4	2	1	5	0.003	1	1	4	2	1	5	0.063
<b>Media</b>																					
27	2	1	5	4	1	5	0.001	2	1	5	4	1	5	<0.001	2	1	5	4	1	5	<0.001

The results of this study also showed that female gender and request for psychological support were associated with varying levels of depression, anxiety and stress. This was in agreement with previous findings [3]. Furthermore, consistent with earlier findings reported by Aslaner et al., we identified the following factors that had a significant negative impact on the participants’ mental health [3]:

- excessive exposure to pandemic news on social and mass media
- inadequate amount of valid information about COVID-19
- vulnerability
- lack of knowledge
- isolation
- lack of job opportunities
- hygiene in the workplace

#### 4. Conclusion

In summary, we were able to demonstrate the negative impacts of the COVID-19 pandemic on the mental state of ab-initio pilots. The findings of this study suggested that almost half of the ab-initio pilots had varying levels of depression and stress, and a quarter of them showed different levels of anxiety. The impaired mental health of ab-initio pilots may jeopardize the flight safety. Therefore, the findings of this study may contribute the flight safety by implementing preventive actions against the contributing factors to mental health disorders (e.g., stress, anxiety, and depression) [13].



Finally, a number of important limitations need to be considered. First, the response rate was low. Second, the sample was representative of ab-initio pilots on a national scale, but it would tend to miss students who were hesitant to participate in the study.

It would be interesting to assess the effects of the COVID-19 pandemic on airline pilots, cabin crews and technicians. Work towards examining the impact of the COVID-19 outbreak on the mental states of airline pilots is in progress in our research team.

This study extends our knowledge on the impact of the COVID-19 pandemic on employees in the aviation industry. This information can be used to develop targeted interventions aimed at planning ahead of time to provide support for ab-initio pilots in the future.

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## Appendix

### SURVEY

#### Part 1. Demographics

##### 1. Gender

Female

Male

Prefer not to say

##### 2. Age

17-23

24-30

31 and older

##### 3. Holding type of license

SPL

PPL

CPL

##### 4. Marital status

Married

Unmarried

##### 5. Did an airline company provide financial assistance for you with a certain time (5 years, 10 years, etc.) of service for tuition related expenses?

Yes

No

##### 6. Has your flight training been ceased or postponed?

Yes

No

##### 7. Do you have any comorbidities (additional disease)?

Yes

No



8. Do you have elderly or high-risk individuals among the family or do you live with those?

Yes

No

9. Have you ever got in contact with a COVID-19 suspected person?

Yes

No

10. Have you ever received psychological support during the pandemic period?

Received

Requesting

Not requesting

Part 2. Situations related to the COVID-19 pandemic

Health of myself/others

11. I am worried about being infected.

12. I think I already got the infection.

13. I am worried about my/my family's other health problems.

14. I am afraid of spreading the infection to my family or others.

15. I am afraid of my parents getting infected.

Vulnerability

16. I think the virus spread can not be controlled.

17. I don't feel safe myself.

18. I feel my life is under threat.

19. I feel I lost control of my life.

Work

20. I feel stressed because of the increase in my workload.

21. I am afraid of doing my job (performing flight training).

22. I think there is not enough equipment (e.g., disinfection kit and protection mask) in training aircraft to prevent contamination and to be protected.

Isolation

23. I think I have been excluded by my relatives and other people because of my job.

24. I am afraid of being isolated or restricting my activities.

Lack of job opportunities

25. I am afraid of the lack of open position in aviation or lack of recruitment in aviation.

Knowledge

26. I think I have a lack of information about preventing the epidemic and protecting myself.

Media

27. News/ TV/ Social Media increases my stress level.

Part.3 DASS-21 Scale

28. I found it hard to wind down during the past week

29. I was aware of dryness of my mouth during the past week

30. I couldn't seem to experience any positive feeling at all during the past week

31. I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion) during the past week

32. I found it difficult to work up the initiative to do things during the past week

33. I tended to over-react to situations during the past week

34. I experienced trembling (e.g., in the hands) during the past week

35. I felt that I was using a lot of nervous energy during the past week

36. I was worried about situations in which I might panic and make a fool of myself during the past week

37. I felt that I had nothing to look forward to during the past week

38. I found myself getting agitated during the past week

39. I found it difficult to relax during the past week

40. I felt down-hearted and blue during the past week

41. I was intolerant of anything that kept me from getting on with what I was doing during the past week

42. I felt I was close to panic during the past week

43. I was unable to become enthusiastic about anything during the past week

44. I felt I wasn't worth much as a person during the past week

45. I felt that I was rather touchy during the past week

46. I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat) during the past week

47. I felt scared without any good reason during the past week

48. I felt that life was meaningless during the past week