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The Psychological Impact on Chinese Pilot Students During the Pandemic – The Lesson Learned

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Abstract

This study was intrigued by routine onsite observation among pilot students who were concerned about the market downturn during the pandemic and career uncertainty in the post-pandemic time. The purpose of this study was to discover how COVID-19 affected pilot students and how they reacted and were accustomed to the pandemic regulations. Human Factors, psychological issues, and the status of safety culture were also surveyed. Purposive sampling was used to select two Chinese Civil Aviation Regulation (CCAR) Part 141 flight schools to participate in an online survey. The Cronbach's alpha, and Spearman's Correlation Coefficient were calculated. The findings exemplify the emergence of Human Factors and psychological issues, while the flight school's safety culture remains strong. Simultaneously, the result of this study provides a reference for stakeholders at flight training institutes for coping with future similar crises.

1. Introduction

The advent of the COVID-19 pandemic has presented formidable challenges to the worldwide aviation industry. Due to the substantial reduction in flights between 2020 and 2022, many aviation professionals faced job insecurity or were furloughed for an uncertain length of time that has resulted in income reduction and financial hardship (Flight Safety Foundation [FSF], 2020 May). Giuntella, Hyde, Saccardo and Sado further reported that the impact of COVID-19 on professionals of air transportation could include psychological/mental health issues such as worry, anxiety, uncertainty, pressure, helplessness, sadness, and loneliness just to name a few (Giuntella, Hyde, Saccardo & Sadoff, 2021).

2. Literature Reviews

To better control the pandemic in China, the National Health Committee (NHC) has required people to wear a face mask, keep a physical distance, wash their hands frequently to prevent virus spread, and has encouraged the public to get vaccinated to avoid potential severe illness or death. However, a study by Dattel, Lubner, Gao, and Xie (2021) showed that pilots seemed to be averse to wearing a face mask during flight training due to inconvenience, discomfort, or lack of oxygen. Also, face masks could become a barrier to effective and clear communication regardless of the advocacy from Aircraft Owners and Pilots Association (AOPA) (2020). In addition, China's NHC also adopted the "Dynamic COVID-Zero" strategy in 2021 until February 2023 that took comprehensive measures to deal with localized COVID-19 cases, hoping to quickly disconnect the transmission chain, and diminish the communicable disease promptly (Liu, Liu & Liang, 2022). The aforementioned protocol automatically applied to all Chinese flight schools where visitors must also provide a negative Polymerase Chain Reaction (PCR) test report and the result must be done within 48 hours before their arrival (Shandong Nanshan International Flight Co. Ltd, 2021).

Not surprisingly, the pandemic has significantly delayed pilot students' training progress and believed that their flight skills have decreased due to the unpredictable lockdowns and consequently reduced training slots (Wu & Shila, 2021). Research on Tertiary education in Australia's undergraduate pilot students shows that the COVID-19 pandemic has even caused some students to voluntarily deviate from their original pilot career path (Miani, Kille, Lee, Zhang & Bates, 2021). The pandemic restrictions and subsequent quarantines resulted in a dearth of training activities, potentially leading to a decline in flight proficiency. Consequently, the lack of flight proficiency

could weaken a student's confidence and intensify the mental and cognitive process during the training activities (Brynes, Rhoades, Williams, Arnaud, & Schneider, 2022; IATA, 2020 Oct.; Olaganathan & Amihan, 2021; Schaper, 2021).

Looking back to 2020, IATA alerted that health protocols, restrictions, and quarantine policies could impose burdens (physical and psychological) on able workers due to the sudden manpower shortage (IATA, 2020 June). This has been echoed by EASA - Safety Issues, published on August 4, 2021 (EASA, 2020) and Ed Johnson of Bloomberg (Johnson, 2021 Oct.). According to Hilditch and Flynn-Evans (2022 May), the quarantine protocols and duty restrictions has increased an able worker's workload, and thus fatigue emerged.

Fatigue has been a repeated human factor affecting operational safety. Fatigue leads to distraction, fixation, tardiness, poor communication and teamwork, and loss of situational awareness (SA) (FAA, 2010). Like drugs and alcohol, fatigue slows down reaction time, decreases awareness, and impairs judgment and the decision-making process (Boyd, 2021, Caron, 2020; FAA, 2010; Jin & Lu, 2019; Keller, Mendonca & Cutter, 2019; Kilic, 2019). Mental fatigue causes distractions that could be stemmed from family issues, policy changes, economic downturns, social relationships, or even personal financial hardship (IATA, 2022).

Besides fatigue, ICAO identifies other Human Factors that could contribute to unsafe operations during the COVID-19 period, including lack of communication, weak company support, and pressure (Masrani, n.d.). According to Wiegmann and Shappell, the Human Factors Analysis and Classification System (HFACS) categorizes human errors into four (4) levels and 18 categories including unsafe acts of operators, preconditions for dangerous acts, unsafe supervision, and organizational influences (Wiegmann and Shappell, 2003, p.71). James Reason states that pilots would exhibit decision errors, skill-based errors, perceptual errors during flight operations attributed to fatigue (Reason, 1997), and occasionally flight rule violations (Tisdall, Zhang & Zhang, 2021). Not only fatigue, but all emerging Human Factors could endanger the necessary vitality for an industry or organization to be safe, productive, and sustainable (Kim, Wong, Han, & Yeung, 2022; Vink, 2021).

Fortunately, airlines and flight schools are recommended to offer psychological and mental support to address Human Factors such as fatigue, stress, distress, pressure, and anxiety in many aspects (Vuorio & Bor, 2020) as some Chinese pilots experience elevated anxiety and depression during the unprecedented COVID-19 pandemic time (Wang, Cheng, Yue, & McAleer, 2020). It is plausible to professionally deal with social and psychological difficulties in the early stage of flight training to avoid operational errors or unintentional mistakes. Amid the pandemic ordeal, many pilot training schools voluntarily create a platform of mutual support for pilot students to ensure their mental wellness (FSF, 2020) as well as organizational safety culture (Civil Aviation Administration of China [CAAC], 2017). There is no doubt that pilot training schools believe that a promising safety culture is pragmatically desired. And the Safety Management System (SMS) would need to be continuously active to improve the safety culture (Beckman Siao, Smith & Corns, 2019; Lu, Bos, & Caldwell, 2007; Lu, Camp, Dalal, & Tasswar, 2022). It is simply because the cognitive perception of safety culture should be deeply rooted in an organization's policies, risk assessment programs, safety assurance plans, managerial supports, and continuous promotion activities (Adjekum & Tous, 2020; Leib & Lu, 2014; Lu, Wang & Jin, 2020).

The purpose of this study is to understand the emerging issues that could have affected pilot students during the pandemic. Lessons learned could generate a reference for managing a similar crisis in the future. The research questions of this study are:

1. What emerging Human Factors impact pilot students' flight training during the pandemic?
2. What psychological factors influence pilot students amid the pandemic, and how do they cope with the resulting effects?
3. What was the pilot students' perception of safety culture during the pandemic time?

3. Methods

Medical professionals utilize a variety of instruments to assess mental health and well-being. Those tests help professionals screen the presence or absence of common mental health conditions, make a formal diagnosis, judge symptom severity and abnormality, and monitor the outcomes across the course of therapy. The common psychological problems related to pilots include pressure, anxiety, depression, fatigue, or eating disorders. Generalized Anxiety Disorder (GAD) assesses people's action frequencies influenced by anxiety feelings (Spitzer, Kroenke & Williams, 2006). Hamilton Anxiety Rating Scale (HAM-A) (Salkovskis, Rimes, Warwick, & Clark, 2002) concentrates on intellectual problems and insomnia. Zimmerman et.al. (2008) designs the Clinically Useful Depression Outcome Scale (CUDOS) to measure a person's feelings of depression caused by imminent factors. The items of the questionnaire of this study are synthetically selected from leading psychological assessment tools such as fear, anxiety, uncertainty, stress, distress, pressure, emotion, fatigue, and other influential factors. Thus, survey questions in the questionnaire are specifically extracted from the following assessment instruments: Generalized Anxiety Disorder 7-item (GAD-7), the Hamilton Rating Scale of Anxiety, the Clinically Useful Depression Outcome Scale (CUDOS) (Buysse Reynolds, Monk, Berman, & Kupfer, 1989). The questionnaire has been pilot tested twice by voluntary pilot students. Purposive sampling is used and two major CCAR Part 141 flight schools in China are invited to participate in this study. The process of research execution is provided below (See Figure 1).

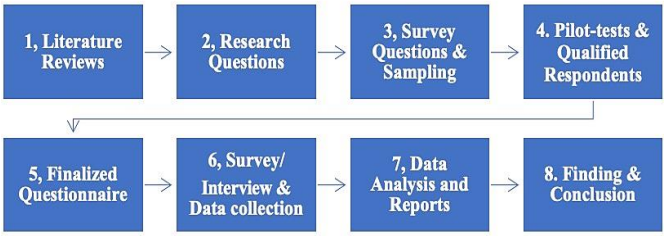

Figure 1. Flow-chart - Project Execution

The IBM SPSS Statistics software is selected to calculate the reliability/consistency of the feedback and demonstrate pictorial results accordingly. Cronbach's alpha is used to coin data consistency and the formula is presented as follows:

$$\alpha = \frac{K}{K-1}\left(\frac{S_y^2 - \sum S_i^2}{S_y^2}\right) \quad (1)$$

K: number of the questions
S_y^2: variance of the total score (the variance of the sum of each respondent's answers for all questions)
$\sum S_i^2$: sum of the individual variance of each question

4. Results

4.1 What emerging Human Factors impact pilot students' flight training during the pandemic?

95 respondents indicated that they have encountered distinct Human Factors during the COVID-19 pandemic time. The result shows that among respondents, "pressure" (58/95, 61.05%), "fatigue" (30/95, 31.57%), and "distraction" (30/95, 31.57%) are three dominant Human Factors followed by "stress" (28/95, 29.47%), "lack of resources" (27/95, 28.42%) and "lack of communication" (27/95, 28.42) (See Figure 2).

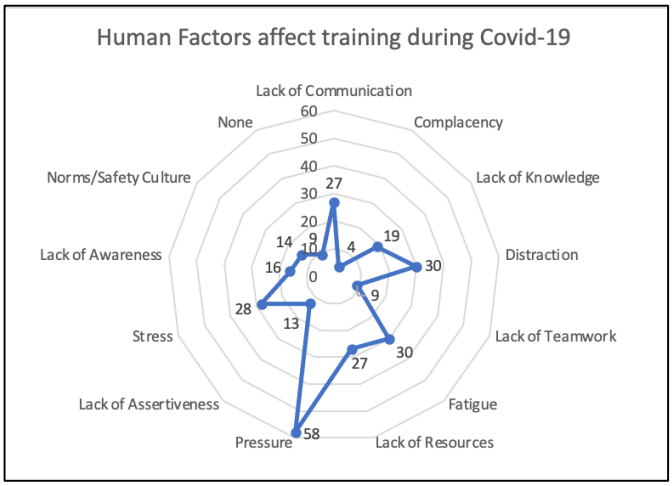

Figure 2. Human Factor Issues Presented in Flight Training During COVID-19

The factor of "pressure" stands out as the most critical concern among respondents. In the specific open-ended question, respondents encounter "pressure" from different spectrums of aspects that lead to (1) the lack of rest, (2) irregular work shifts, and (3) work-life imbalance. Ultimately, pressure indirectly forms a fallacious precursor of fatigue. Not surprisingly, respondents indicate that "fatigue" could lead to pilot distraction, which could also result in low-quality operations, erroneous procedures, or poor decisions in the cockpit. Fortunately, only 4.2% (4/95) respondents indicate "complacency" and 10.5% (10/95) state "none" regarding encountered Human Factors during the survey.

4.2. What psychological factors influence pilot students amid the pandemic, and how do they cope with the resulting effects?

Questions of this section are designed to obtain respondents' psychological and mental well-being during COVID-19 using Likert Scale (1: Strongly Disagree, 5: Strongly Agree). In this section, the authors evaluate internal data consistency by using Cronbach's alpha of the two Likert Scale questions related to psychological factors. The Cronbach's alpha is 0.710, which affirmatively helps researchers to realize respondents' attitudes toward mental or psychological health consultant service and their overall self-assessment of mental health conditions (See Table 1).

Table 1. Cronbach's Alpha of Psychological Factors Section

Number of Likert Scale Questions (K)	**2**
Number of Responses	95
Sum of individual questions variances ($\sum S_i^2$)	3.396
Variance of the total score (S_y^2)	5.209
Cronbach's alpha (α)	0.710

Respondents indicate that "Uncertainty" (38/95, 40%) and "tress" (34/95, 35.79%) are two prevailing psychological factors they have perceived. Additionally, many respondents express their feeling of "anxiety" (26/95, 27.37%), "worry" (25/95, 26.31%), "financial hardship" (22/95, 23.15%), followed by "fatigue" (20/95, 21.05%) and "distress" (20/95, 21.05%). The "poor social relationship" (15/95, 15.79%) is not significant but highlights the necessity for well-prepared social activities at the training bases (see Figure 3).

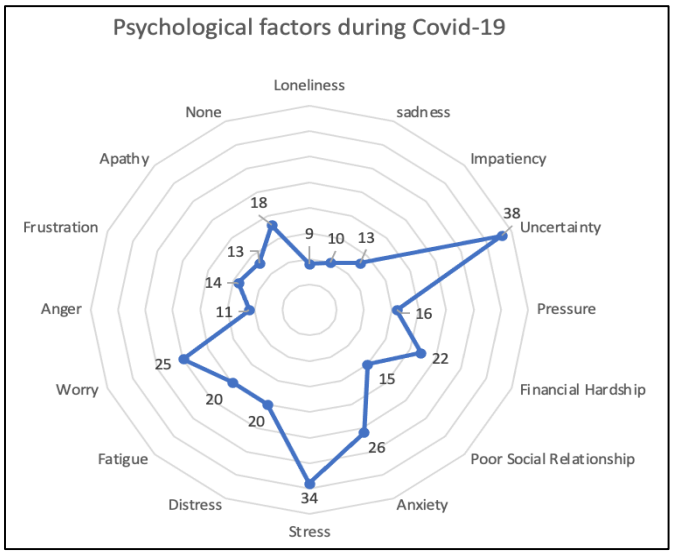

Figure 3. Psychological Factors Students Encountered during COVID-19

When inquiring respondents' opinions on getting mental/psychological health consultant service, 73 (76.84%) respondents agree that flight schools need to provide such service. There were 67 (70.52%) respondents who are aware that their flight schools do provide consultant service and 32 (33.68%) take part in the service including twenty (20) respondents who respond that it is helpful and worthwhile. Among the remaining 35 respondents who do not participate in the consultant service, 68 (71.57%) of them are willing to take the service when deemed necessary. Lastly, for the 28 students whose flight schools do not provide consultant service, 22 of them advocate initiating a similar psychological/mental health service in place (See Table 2).

Table 2. Descriptive Statistic of Flight School Mental Health Consultant Need and Service

Questions			Average or %
It is important to seek mental/psychological health support/consultant if there is a need.			4.05
My flight program provides mental health consultant.	Yes (%) 67 (70.53%)	No (%) 7 (7.37%)	Not sure (%) 21 (22.11%)
I have been to mental health consultant service during COVID-19. (Note: For 67 respondents who selected "Yes" in Q.4.3)	Yes (%) 32/67 (47.76%)	No (%) 35 /67 (52.24%)	
			Average
I think my flight department need to have a comprehensive mental health consultant service. *(Note: Based on 28 respondents who select "No" (7) or "Not Sure" (21) in Q.4.3)*			3.93
I think the consultant service is useful. *(Note: Based on the 20 out of 32 respondents selected "Yes" in Q.4.4)*			3.69
I am willing to go to the consultant service in the future *(Note: Based on the 35 respondents selected "No" in Q.4.4)*			4.09
I believe my overall mental health condition is good during COVID-19 *(For all 95 respondents)*			3.67

4.3. What was pilot students' perception of safety culture during the COVID-19 pandemic time?

This section is designed to measure the ongoing safety culture during the pandemic. The Cronbach's alpha is 0.9752 which reflects on the consistency of answers concerning the four (4) subcultures of the safety culture. The average score of 4.03 shows a promising safety culture during the COVID-19 pandemic time. The Cronbach's alpha of each subculture concerning just, reporting, informed, and learning cultures is very strong (See Table 3).

To further analyze, while safety remains the operational priority during the pandemic, routine safety committee meetings are held periodically resonating with the high score of reporting, just, informed, and learning cultures. Remarkably, reporting culture and informed culture yield the highest Spearman Correlation Coefficient, 0.89. There is a strong relationship between reporting culture and routine safety meetings with a 0.83 Correlation Coefficient indicating that most respondents support the hazard reporting system also recognize the benefit of routine safety meetings. The Correlation Coefficient between the reporting culture and learning culture is 0.83, showing that pilot students acknowledge the importance of a reporting system as well as the learning culture. Diagram 1 below illustrates the Spearman Correlation Coefficient among safety culture questions. Overall, the Spearman Correlation Coefficient varies between 0.735 to 0.910 (See Diagram 1).

Table 3. Descriptive Statistics of the Likert Scale - Questions in the Safety Culture Section

Questions	Average	Cronbach's alpha if deleted from this section
Safety remained the core value at my flight training institute during COVID-19.	4.22	0.972
My flight training program conducted safety meetings periodically or whenever is necessary during COVID-19.	4.09	0.97
I have been willing to report hazards regardless of COVID-19.	4.05	0.97
I trust that the review of a hazard report has been effective and fair.	4.02	0.975
My institute has routinely informed me the safety status regardless of COVID-19.	4.01	0.971
I can adapt to new safety standards and changes regardless of COVID-19.	3.97	0.971
The top executives of my institute showed strong supports to safety during COVID-19.	4.03	0.971

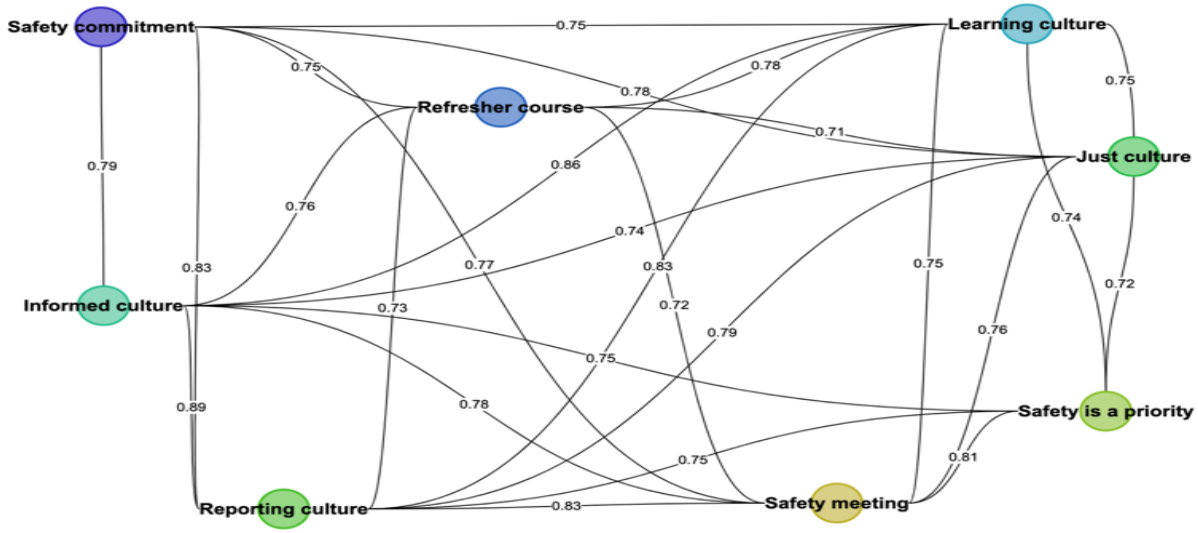

Diagram 1. Spearman Correlation Graph of the Likert Scale Questions in the Safety Culture Section

In addition, regarding the learning culture and refresher courses, respondents indicate that pilot students are adaptable to learning from the new standards and policies while advocating the need for refresher courses. The Correlation Coefficient is 0.63 between safety priority and safety commitment, which shows top executives of the flight schools do accentuate the importance of flight safety during the pandemic time by making an administrator's commitment appealing.

Diagram 1 presents that all Spearman Correlation Coefficients are greater than 0.6 and show that reporting, just, learning, and informed culture have been highly intercorrelated underpinning the school's Safety Management Systems (SMS) amid the pandemic challenges.

4.4. Discussion

Emerging Human Factors. Pressure, fatigue, and distraction are the three top Human Factors perceived by the respondents. The fatigue problem that Chinese pilot students faced is truly associated with the high pressure brought about by the pandemic, especially, in a closed campus/base with limited social interaction and open activity. When people live in a confined space for an extended period, some could encounter difficulties in making new friends or adapting to the rapidly changing community. Persistent concerns in their minds prevent students from getting proper rest and therefore fatigue emerged. In addition, mandatory COVID-19 obedience could lead to pressure, stress, distraction, lack of teamwork and skills, work-life imbalance, and ultimately erroneous decisions during flight training, which unquestionably could affect flight safety.

Psychological/Mental Health Problems Pilot Students Encountered. Due to the unpredictable development of the COVID-19 pandemic between 2021 and 2022, the recovery of the aviation industry was unsure. Most respondents choose "uncertainty" as the leading psychological issue followed by "stress", "anxiety" and "worry." The result mirrors Air Line Pilots Association (ALPA) research results confirming the existence of psychological impacts during the COVID-19 pandemic (Freeze, 2022). By the time of this study, Chinese flight schools were still under strict pandemic control. The finding of "anxiety" from respondents aligns with Wang and Zha''s research outcome despite the Chinese airlines' guaranteed hire (Wang & Zhao, 2020).

Furthermore, an extended period of the campus lockdown could lead to severe mental impacts on students as they are reframed from in-person interaction and thus feel stressed, vulnerable, and lonely under such strict pandemic measures (Wang, Cheng, Yue & McAleer, 2020).

Important Mental Health Consultation Services. The surveyed flight schools do proactively provide consultation services to assist pilot students in improving mental health so as to strengthen their confidence, psychological integrity, and self-esteem similar to the findings from the studies of Carleton, Norton, and Asmundson in 2007 and Cox, Holden, and Sagovsky in 1987. Respondents believe that getting consultation services is beneficial, and most of them prefer to visit consultants soon. It should be specifically noted that not all respondents are aware of the existence of the consultation services.

Safety remains the top priority during COVID-19 in spite of the interrupted routine training. Flight training institutes in China persistently reiterate safety by conducting safety workshops and group meetings and collecting hazard reports to continue supporting the mandatory SMS. From the survey result, the four sub-cultures (reporting, informed, just, and learning cultures) are strongly intact.

5. Conclusion

This study surveys pilot students in China regarding the impact of the COVID-19 pandemic. Besides the strict pandemic protocols that respondents must abide by, this study discovers Human Factors and psychological issues perceived by pilot students during the pandemic. Pressure, fatigue, and distraction are the three top Human Factors and uncertainty is the leading psychological issue according to respondents. With flight training being interrupted to a great extent while the recovery of the aviation industry is unsure, psychological issues affecting mental well-being cannot be ignored. Practical consultation services are offered to help improve students' confidence, self-esteem, and integrity. It is worth noting that safety culture remains persistent during this unusual pandemic time. Even if the risk of COVID-19 has been downgraded to the endemic category, lessons learned from COVID-19 remain robust and enduring for managing the future similar etiological emergency. The findings of this study are meaningful to practitioners, readers, interested researchers, and stakeholders as a quick reference when encountering a similar crisis. This study is equally important to pilot students to remain resilient and maintain a healthy personality by identifying precursors of mental health as well as psychological issues during the early stage of their flight career development.

6. Future Study

Given the time constraints, the forthcoming study should include all Chinese flight schools so as to increase the generalizability and practicality of the research finding. In addition, flight students in the United States could also be included to enable a comparative analysis concerning students' perception of psychological impact, human factor issues, and safety culture during the pandemic crisis.

Ethical approval

Not applicable.

Conflicts of Interest

There is no conflict of interest regarding the publication of this paper.

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