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PERSONALITY TRAITS AND SAFETY ATTITUDE AMONG AVIATORS: A CORRELATIONAL STUDY

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ABSTRACT

Objective*: The current study was aimed to determine the relationship between personality traits and safety attitudes among the aviators of Pakistan.*
Design of the study*: Correlational and Predictive research design.*
Place and Duration of the study*: Islamabad, Lahore, Peshawar, Multan, and Karachi Pakistan. March, 2018 – April, 2020.*
Sample and Method: *135 (One hundred thirty-five) aviators from Pakistan were the sample of the present study; among them, 55 were from commercial aviation, and 80 were from general aviation. The aviators were selected on the basis of a convenient sampling technique.*
Results and Conclusion: *The findings of the linear regression analysis showed that conscientiousness and extraversion are significantly strong predictors of safety attitudes (p =.000). Additionally, there was a marginal correlation between agreeableness and neuroticism with safety attitudes. However, the neuroticism relation is inverse in nature. The age and type of flying (commercial or general aviation) have no significant difference among the safety attitudes of aviators. The research will be beneficial in the selection and training of pilots for improved safety in Pakistan airspace.*

Keywords: *Aviation; Personality; Safety Attitude; Aviators; Commercial pilots; General Aviation pilots*

INTRODUCTION

Human Factors in aviation are about people and their interactions with machines, procedures, the environment, and other people. As a factor in the aviation system, man is the most adaptive, flexible, and essential component, but also the most vulnerable to influences that can adversely affect their performance. In other words, it is a collection of physiological and psychological factors that are significant for human performance. When human performance is affected, it often results in a breach of safety and a subsequent accident (Martinussen & Hunter, 2017). Personality and attitudes of aviators, especially towards safety, influence their performance and work environment. The research revealed that poor safety attitudes and personality traits enhanced the likelihood of pilot error, which is considered one of the primary causes of aviation accidents (Lubner, 1992). Modern aircraft have substantially enhanced reliability and safety in aviation and significantly lowered the number of aircraft accidents. However, the consequences of pilot error in such a demanding scenario are still devastating in terms of both lives and costs (Fraser, 2020). Another reason personalities are so influential in aviation is that they distinguish aviators from the general public (Dickens, 2014).

Incidents like Germanwings and Mozambique Airlines flights, which lost hundreds of people, demonstrate the importance of the pilot's safety attitude and personality. Investigating the role of these unobserved human factors in an accident is challenging. Between 2003 and 2012, the National Transportation Safety Board (NTSB) identified eight incidents in which pilots knowingly pushed their aircraft into a situation from which recovery was impossible, short of a disaster. Consequently, aviation studies in the last several decades have focused heavily on pilots' personalities in an effort to isolate a specific set of traits that pilots bring into the equation in terms of flight safety (NTSB, 2005). Similar disasters in commercial aviation in Pakistan have raised concerns about the impact of aviators' personalities and the need for synchronised safety behaviors. According to sources on the plane crash, the aircraft crashes were caused by the captain's and first officer's poor attitudes towards safety combined with their contrasting personalities (Bhoja BHO 213 AAA Report, 2015).

Personality, skills, and attitudes of pilots are considered crucial in predicting their overall performance, especially in the realm of safety (Chidester et al., 1991). Team performance and coordination in the cockpit were favourably augmented when the captain’s personality was positively added on (Bowles et

al., 2000) and adversely affected when the first officer failed to intervene against the unsafe decisions and acts of the captain (Bienefeld & Grote, 2012). Moreover, aircraft accidents are also attributed to attitude toward safety and skill rather than the personality of the aviator (Walton & Politano, 2016). According to Burger (2019), a person's unique patterns of consistent behaviour and the psychological processes that underlie those patterns make up their personality. The term "trait" is widely used to refer to these enduring patterns of behaviour. Personality traits are characteristics that may be recalled about a person and defined in terms such as whether or not they are friendly, aggressive, sad, or truthful. A person's manifestation of these traits is constant and predictable across contexts. In a very demanding and stressful flying scenario, the pilot responds in accordance with his character traits. So, knowing a pilot's personality can help you predict what they will do in the plane (Goeters, 1998).

Developments in personality assessment construction have led to more accurate knowledge and insight into the identification of personality characteristics. Each person has a unique combination of the five personality traits of extraversion, conscientiousness, agreeableness, openness to experience, and neuroticism (John et al., 2008). The big-five model is widely regarded as a breakthrough by trait theorists interested in analysing personality types across all demographics and socioeconomic groups (Carver & Scheier, 2017). It has been found that conscientiousness, neuroticism, and extroversion are inherited, but agreeableness is shaped by upbringing (Bergeman et al., 1993).

Aviators are more extraverted because their professions require collaboration and confidence. Another important feature in becoming a successful aviator in aviation is conscientiousness (Castaneda, 2004). Being open to new experiences involves being inquisitive and innovative (Burger, 2019). Aviators score low on the scale due to their workplace conformity (McCrae & Sutin, 2009). Interpersonal attitudes determine agreeability (Piedmont, 1998). Being pleasant is one factor that influences the success of developing positive relationships with others (Digman, 1997). Individuals who are anxious, stressed out, worried, and unrealistic in aviation are more likely to engage in unsafe behaviour or cause an accident (Martinussen, 1996).

Safety attitude is the tendency to recognize and evaluate workplace safety principles, which are generally stable and have both emotional and affective aspects (Dobrowolska et al., 2020). People's attitudes on aviation safety are shaped by their prior experience and knowledge (Vinodkumar & Bhasi,

2010). In general, if a person's safety behaviour has to be modified, it is often required to make significant adjustments to the attitude that person has about safety. There is a reduced risk of accidents and near-misses when supervisors promote safe conduct. Positive safety attitudes of individuals contribute inherently to the mitigation of hazardous situations (Donald & Canter, 1994).

Safety attitude of aviator comprises of opinions and knowledge regarding an object or situation as well as his own beliefs, intentions, actions, and external social factors at workplace in aviation (Hunter, 2002). According to Hunter (2005) safety attitude is the combination of self-confidence, safety orientation, and risk orientation. Pilot behaviour and decision-making are impacted by psychological elements that serve as a broad indicator of aviation safety attitudes. Therefore, a pilot's perception of safety is defined by his own beliefs and behaviours (Cooper & Phillips, 2004). The experiences of pilots in routine, scheduled and unexpected operations impact their attitudes toward safety. Therefore, one of the most essential components of flying is establishing favourable safety attitudes in aviation, especially among aviators. Pilots cultivate knowledge-based attitudes that increase overall safety while flying. Pilots may understand the need of having a safety attitude, but invariably forget to apply suitable strategies to control the recurrence of risky behaviours (Hyde & Cross, 2018). In aviation a change in attitudes is attributed to an accident or event of recent past that help the aviator to initiate the procedure to prevent similar kind of accidents or incident in future. The relationship between safety attitudes and safety behaviours is influenced by pilots' responses to risks in the environment and their own thoughts and feelings about those risks (Wilson et al., 1989).

Helmreich et al., (2001) recognised safety attitude as a key factor in improving operational safety and efficiency in aviation. Positive safety attitude among aviators commonly known as safety-first mentality is reflected in factors such as teamwork, motivation, and a strict adherence to all applicable safety policies and procedures. A poor attitude toward aviation safety presents itself as impulsivity, complacency, and increased number of accidents (FAA, 1991).

Poor decision making among aviators were studied by Berlin et al. (1982) and identified five hazardous safety attitudes. These attitudes are impulsivity, anti-authority, resignation, invulnerability, and macho (Diehl, 1990). Hunter (2005) indicated that the significance of safety attitudes is widely acknowledged as a critical component of aviation decision-making which the

pilot's thoughts, emotions, and actions. Hazardous attitudes i.e. anti-authority (92%) and invulnerability (68%) contributed heavily in poor decision making of aviators (Nuñez et al., 2019). Pilots who have hazardous attitudes are more likely to react in ways that cause a threat to others or have unfavourable outcomes. Simply, this is the inner drive that determines how well a pilot can judge situations and make judgments. (Lee & Park, 2016).

Lester and Bombaci (1984) surveyed 35 general aviation pilots to investigate relationship between personality of pilots and hazardous attitude and found that integration/ self-concept scale of Cattell's Sixteen Personality Factor (16 PF) was positively associated with hazardous attitudes. Furthermore, invulnerability (43%), impulsivity (14%) and macho (14%) were prevailing hazardous attitudes among the pilots. On a sample of 2,857 aviators Winter et al. (2021) studied the association of personality traits with risk perception and safety attitudes function as mediators. Personal characteristics positively strengthen pilots' risk perception and self-confidence mediate risk perception actively. In other wards as pilots develop confidence and competence, they should be cautious in taking risks.

Aviation organizations in Pakistan primarily deal with procedures and techniques through Safety Management System (SMS) and Crew Resource Management (CRM) as a compliance to ICAO regulations (Wagener & Ison, 2014) ignoring human factors, such as personality and attitude. The literature on the personality of pilots and their safety attitude indicates that personality traits, i.e., conscientiousness and extraversion, are positively associated with safety attitudes in establishing safety setups in aviation (Martinussen & Hunter, 2017) and among automobile drivers (Dahlen et al., 2012). In Pakistan, there has not been a single study done to determine the efficacy and advantages of such a relationship. The current study will address the vacuum in aviation that subsequently will be assisting in selection, training, and safe operation. Based on the literature, the following set of hypotheses has been proposed:

1) Conscientiousness and extraversion positively predict safety attitude of aviators.

2) As aviators grow older their safety attitude will be higher

3) Commercial aviators will have higher safety attitude than general aviation aviators

METHOD

Participants

The study was conducted on a sample of 135 Pakistani aviators from commercial aviation and general aviation through convenient sampling. The age was grouped into young (21 – 35, M = 28.5), middle aged (36 – 50, M = 42), and old aged pilots (51-65 years, M = 58.5), and flying types was divided three groups; Commercial aviation (commercial airline pilot of Pakistan), and general aviation (pilot other than commercial airline).

During data collection, the following inclusion criteria were taken into account:

- Pilots with PPL (Private Pilot Licence), CPL (Commercial Pilot Licence), or ATPL (Airline Transport Pilot Licence).
- Pilots flying in any commercial airline or in any flying club/ chartered operators commonly known as general aviation (GA).
- Pilots currently flying in military setups are excluded from the study.

Measures

Big Five Inventory (BFI)

Big Five Inventory of personality by John et al. (2008) was used to identify the level of five personality traits. Six secondary facets of each major personality component can be assessed for diversity of findings (Paunonen & Ashton, 2001); however, the study will remain at factor level. Alpha coefficient of scale is 0.682 where sub-scales have Extraversion (0.77), Agreeableness (0.636), Conscientiousness (0.699), Neuroticism (0.680) and Openness to Experience (0.724).

Aviation Safety Attitude Scale (ASAS)

Aviation Safety Attitude Scale (ASAS) by Hunter (2005) was used to measure safety attitude of pilots in commercial aviation. Self-confidence (SC), risk orientation (RO), and safety orientation (SO) are the three factors of the scale. The individual degree of a factor predicts more positive attitude. The alphas coefficient of ASAS was .75 whereas SC was .76, RO.59, and SO .40

(Hunter, 2005). The scale has already been used to measure the construct in aviation research (Drinkwater & Molesworth, 2010; Hunter, 2005; Molesworth & Chang, 2009); hence it was employed in the present study due to its acceptability and usage in earlier studies. In the current study coefficient alpha is 0.753 where was sub-factors SC, RO and SO has 0.67, 0.68 and 0.45 respectively.

Research Design

Exploratory Pearson two-tailed correlation analyses were calculated for the scales and sub-scales to find out whether or not there were statistically any significant relationships between the variables present or not. For a better understanding of the relationships of the research variables, correlational design was preferred over experimental design. Correlational study designs were used in past research on personality traits and other attributes in aviation (Chang et al., 2018; Mouw, 2020; Wetmore et al., 2007). The desire to demonstrate connections between aviation safety attitudes (criterion variables) and the personality domain (predictor components) supported the correlational research design, as did the standard set by previous similar studies (Gravetter & Wallnau, 2013).

Procedure

The relation of personality with safety attitude was investigated by using correlational research design with convenient sampling from pilots of commercial and general aviation of Pakistan. The ethical considerations laid down by American Psychological Association (APA) were ensured during the study especially, at the time of instruction about the confidentially and their withdrawal from study any time without any reason. Cronbach Alpha values were calculated for the scales, before the actual test administration. Each test's alpha was at least 0.7, which is the cut off for the majority of tests (Lance et al., 2006). Furthermore, the ASAS is widely used and easy to understand, making it the only instrument for assessing pilots' opinions on aviation safety. The hypotheses were tested using regression analysis and the t-test for comparing means.

RESULTS

Table 1
Demographic Variables in terms of Frequency and Percentage (N = 135)

Variables	*Frequency (f)*	*Percentage (%)*
Age (Years)		
21-35	74	54.8
36-50	41	30.4
51-65 & Above	20	14.8
Type of Flying		
Commercial	55	40.7
General Aviation	80	59.3

Table 2
Correlation, Means, Standard Deviations and Cronbach Alpha for Personality Traits and Safety Attitudes (N = 135)

Variables	1	2	3	4	5	6	7	8	9	*M*	*SD*	*α*
1	-	.218*	.563**	.812**	.512**	.311**	.556**	-.428**	.198*	46.77	5.018	.666
2		-	.355**	.715**	.339**	-.046	.317**	.029	-.086	22.41	4.491	.681
3			-	.739**	.453**	.304**	.523**	-.228**	.090	15.01	2.139	.448
4				-	.571**	.225**	.600**	-.282**	.090	84.20	8.874	.753
5					-	.138	.504**	-.274**	.042	29.07	4.840	.770
6						-	.338**	-.158	.255**	33.70	4.002	.636
7							-	-.342**	.136	34.34	4.111	.699
8								-	-.123	20.96	5.376	.680
9									-	33.59	4.951	.724

Note. 1 = Self-confidence; 2 = Risk Orientation; 3 = Safety Orientation; 4 = Safety Attitude; 5 = Extraversion; 6 = Agreeableness; 7 = Conscientiousness; 8 = Neuroticism; 9 = Openness to Experience *p < .05. **p < .01.

Note: The results of correlational matrix indicate that safety attitude is significantly correlated with extraversion and conscientiousness. The correlation between agreeableness and neuroticism with safety attitudes is marginal but the neuroticism relation is negative in nature.

Table 3

Regression Analysis of Personality Traits as Predictor of Safety Attitude in aviators of Pakistan (N = 135)

Model	*B*	*SE B*	*B*	*t*	*Sig.*	*95% CI*	
						LL	*UL*
(Constant)	34.59	8.11	-	4.27	.000	18.55	50.63
Extroversion	.65	.14	.36	4.71	.000**	.379	.927
Agreeableness	.08	.16	.03	.48	.630	-.234	.385
Consciousness	.85	.18	.39	4.86	.000**	.503	1.194
Neuroticism	-.07	.12	-.04	-.63	.529	-.300	.155
Openness	.01	.12	.01	.11	.912	-.225	.252
R^2	.46						
ΔR^2	.44						
F	22.01						

df = 5, 129

Note: The results through regression analysis confirm that extraversion and conscientiousness predict safety attitude among pilots at significant level.

Table 4

Mean, Standard Deviation, and One way AVOVA of Safety Attitude across different age groups (N = 135)

Variable	Younger Pilots		Middle Aged Pilots		Old Aged Pilots		*F (2, 132)*	η2	*Sig.*
	M	*SD*	*M*	*SD*	*M*	*SD*			
Safety Attitude	84.04	9.05	84.61	8.93	83.95	8.50	0.063	.986	.939

Note: The age of pilots does not have any influence on safety attitude. Safety attitude across ages remain same.

Table 5
Comparison of mean (t-test) between commercial and general aviation aviators (N = 135)

Variable	*Commercial Aviation*		*General Aviation*		*r (133)*	*p*	*Cohen's d*
	M	*SD*	*M*	*SD*			
Safety Attitude	82.85	7.771	85.12	9.495	-1.47	.320	0.26

Note: There is no significant difference in safety attitude of commercial and general aviation pilots.

DISCUSSION

The recent air crashes of Bhoja Air BHO 213 and PIA Flight PK-8303 has questioned the role personality and safety attitude among the aviators of Pakistan. Therefore, present study aimed to analyse the share of personality traits in predicting the safety attitudes among 135 pilots of commercial (N=55, 41%) and general aviation (N=80, 59%) of Pakistan. The results (Table 3) supported the research hypotheses of current study that pilots' personality traits ensure high level of safety attitude among aviators. The five domains of personality (i.e. extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience) revealed 44% variance in the scores of safety attitude. The results further indicated that conscientiousness and extraversion predicted safety attitude at significant level. Findings of the correlational analysis indicated that agreeableness and neuroticism also significantly correlated with safety attitude but weak in nature. However, the relationship of neuroticism is negative in direction.

The findings of the current research are supported by Winter et al. (2021) study in which the relationships between safety attitude, personality and the role of risk perception, altitude, and flight risk were investigated. The results showed that risk perception and self-confidence (a major sub-scale of aviation safety attitude, according to Hunter, 2005) were positively correlated with consciousness at significant level. Furthermore, it was revealed that self-confidence augmented the relationship between risk perception and personality. This association indicated a general trend among pilots that their degree of confidence would increase in directly proportional to their level of experience.

More risk-taking and confidence-boosting behaviour would occur when individuals rated their abilities as high (Winter et al., 2021).

In contrast to the present findings, Mehdad and Ghasemi (2018) discovered no significant difference among personality characteristics and safety attitudes between injured and non-injured employees in Iran. Such work-related injuries were often attributed to the hazardous conditions of the workplace. There is a weak but positive link between safety attitude, agreeableness, and neuroticism. Furthermore, safety attitude is inversely related to neuroticism, suggesting that pilots with low scores on this measure tend to have a more safety attitude.

Mallia et al. (2015) discovered a similar relationship between personality factors and safety attitudes among Italian bus drivers. According to the study's findings revealed that excitement seeking (extraversion) and altruism (agreeableness) significantly and positively drivers' attitudes toward traffic safety. Through safety attitude, conscientiousness may influence conforming safety behaviour both directly and indirectly. Moreover, the findings of present study about the inverse relation of neuroticism with safety attitudes are also consistent with the results of Chen (2009) that anxiety (facet of neuroticism) has a negative relation with the risk-taking attitude of drivers on a sample of 257 motorcyclists of Taiwan.

The study's second hypothesis attempted to examine whether or not there was a correlation between age and a person's attitude toward safety. The results showed that based on safety attitudes; there is no significant difference between age groups of pilots. Bazargan and Guzhva (2011) measured safety attitudes through pilot error and accidents and found that there is no significant evidence that age has a significant influence over fatal accidents and pilot error in general aviation. Moreover, According to Broach (2000)'s analysis, elder pilots had a similar safety record to that of their younger colleagues.

The final hypothesis tested in this study expected that there would be a significant difference in safety attitudes between commercial and general aviation pilots. A comparison of means (t-test) was carried out and results revealed that there is no significant difference ($t = -1.522$, $df = 128$, $p = .130$) between pilots of commercial ($M = 82.85$, $SD = 7.77$) and general aviation ($M = 85.12$, $SD = 9.49$) on their safety attitudes, although general aviation pilots scored higher than commercial pilots.

These findings are in accordance with the claims made by Fischer et al. (2003) when the scores of 22 general aviation and 27 commercial pilots were analysed. The results showed no significant difference in their attitude toward risk perception.

Hunter (2002) statistically observed an almost similar relation between private and commercial pilots using post hoc comparison. The Bonferroni correction results indicated that safety and risk orientation have no significant difference between the scores of these groups. However, on the subscale of the aviation safety attitudes scale, i.e., self-confidence had a significant difference ($F = 42.296$, $p < .0005$).

Conclusion

The commercial and general aviation sectors in Pakistan invest heavily in the technical aspect to improve safety while ignoring human factors. Consequently, the personnel and administration of the organization put a great deal of effort into acquiring technical knowledge instead of studying psychological traits and their significance towards flight safety in their operations. Personality and its relationship with safety attitudes in the skies above Pakistan were the focus of this research study. The study concluded that conscientiousness and extraversion positively predict safety attitudes among pilots, and the level of safety attitudes across commercial and general aviation remains the same. The study will help the pilots to introspect about their personality features and how they affect their safety attitudes. They will be more motivated to alter risky practises after this realisation, which will positively impact safety. This research will be helpful in analysing the implications of these variables on selection, training, and accident prevention. Additionally, it will contribute to establishing training programmes that would somehow ensure the aerospace of Pakistan safer.

Limitations and Recommendations

The major limitation of the study was choosing participants through a convenient sampling method, which involved selecting a sample from two primary group sources, direct and indirect (through reference). The study's generalizability is limited by using non-probability sampling rather than random sampling (Bordens & Abbott, 2018). Lastly, Respondents' subjectivity and potential bias were both factors in the reliability of self-report surveys. Gordon

(2001) claims that pilots have a more defensive personality and actively want to impress people who are likely to have an impact on the overall innate feelings of pilots.

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