Original Research

Personality Maneuvers Flyers Fatigue: Indian Civil Aviation Scenario

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ABSTRACT

Pilots work in a demanding environment and it requires a lot of physical and mental fitness to handle the situation. This study investigated the relationship between the personality domains and fatigue dimensions in the Indian civil pilots. 53 civil pilots who had reported for their annual medical examination voluntarily participated in the study. The data of 3 pilots was found inadequate and hence was not considered for analysis. The NEO-FFI questionnaire was used for personality and the Chalder's Fatigue scale for fatigue dimensions. A demographic inventory was administered for demographic characteristics of the sample. Statistical analysis (N=50) was done with PASW Statistical 17 Package. The mean age of the pilots were (N=50) 41.68±11.2 yrs. The mean years of service (N=50) were 14.27±10.61 yrs with an average of 7013.38±5821 total flying hours. The descriptive data showed that the civil pilots were in an average range profile of the adult population norms on the domains of personality except on neuroticism and agreeableness dimensions where the sample has obtained low scores. The data also revealed that the sample manifested average levels of physical fatigue and mental fatigue. There was significant positive correlation ($r = 0.354$; $p < 0.05$) between openness and physical fatigue and a significant negative correlation ($r = -0.479$; $p < 0.01$) between conscientiousness and mental fatigue. ANOVA was computed for any significant difference in mean values on physical fatigue and mental fatigue across demographic characteristics. The results showed that those pilots who perceive their career as a demanding profession rather than being enthusiastic and appreciating their vocation experience high physical fatigue and depleted energies while those adhering to the rules, procedures and protocols experience less mental fatigue. The personality traits and demographic characteristics to certain extent influence the pilot's perception to physical and mental fatigue and these aspects must be borne while assigning flying duties.

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Key Words: Physical Fatigue, Mental Fatigue, Personality

Introduction

"Fatigue is often caused not by work, but by worry, frustration and resentment". [1] Being an airline pilot is seen as the best job in the world. Pilot is trusted to command a multi-million dollar piece of machinery, carry more than 100 passengers on an average over thousands of miles in all types of weather. Recently Indian civil aviation sector has grown manifold. The rapid growth of Indian economy has resulted in spillover effect on the airline industry in India. Pilot performs a variety of complex tasks requiring high degree of both physical and mental well being. On the whole, the career of pilot is seen as: "Hard work? Yes; Fun? Absolutely; Any job like it? No!"

Most career fields have people who embrace at least some of the most common personality traits to do well in their jobs. People possessing certain personality traits often succeed remarkably well in some careers yet fail in others. As a result, many airlines employ personality tests to determine suitability for employment and assess a pilot's potential and performance during crisis. There are certain times during a flight when workload tends to peak. High workload tends to occur during the take off and final approach phases of flight. During these times any additional task or emergency such as an ATC request or a change in the flight plan

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imposes increased workload and may reduce performance of the operator. Therefore handling such environmental exigencies requires the pilot not only to have skill in flying but also to possess a stable personality which plays a critical role in crew coordination and safety of flight. It is in these times, that the true mettle of the pilot comes into picture.

Research on pilot personality has revealed that pilots embrace at least some of the most common personality traits to do well in their jobs. A study carried out on pilot personality, have described that pilots score low or very low for neuroticism, anxiety, angry hostility, depression, self-conscious, impulsiveness and vulnerability; while they score very high for conscientiousness, competence, dutifulness, achievement striving, self-discipline, deliberation, assertiveness, activity and positive emotions. Pilots score average for extraversion, gregariousness, openness, agreeableness, trust, straightforwardness, modesty and tender mindedness [2].

Rose [3], on pilots posted that they "generally have good social skills and good reasoning and are able to deal with complex information, make decisions and deal with people. Thus, they tend to be bright and capable of good social interaction when called for. Pilots are "the standard for optimism and confidently-expressed attitudes" and do a good job of "keeping emotion out of the cockpit".

Since pilots must maintain their health, as a group they are energetic and have good stamina, and while appearing to be "rapid-fire in the cockpit" are actually quite slow and methodical, not particularly warm interpersonally. Pilot is much more assertive and physically active, and he seeks excitement and stimulation. The average pilot appears to be altruistic, but at the same time he is highly competitive, skeptical, and tough-minded. He describes himself as achievement oriented, highly competent, responsible, and capable of handling high levels of stress.

Ursano [4] describes pilots to be physically healthy, lacks signs of neurosis, self-sufficient, high need to achieve, prefers short-range goals to long-range goals, non-intellectually oriented, seeks responsibility and novelty, emotionally avoidant, more concerned with modifying their environment than changing their own behavior, limited choice in activities, low tolerance toward personal imperfections, need excitement, need individual initiative, ignore and avoid inner feelings, inner feelings perceived as external, avoid introspection (looking within one's own mind or feelings), cautious about close relationships, avoid revealing true feelings, avoid brooding and fighting, rarely become tearful, use humor to cope with anxiety or stress, keep thoughts concrete, have difficulty with ambiguous situations, don't handle failures well, find it difficult to cope when confronted with emotional situations.

Nevertheless, the workload can compromise aviator performance by producing critical levels of fatigue. The key scheduling factors contributing to the development of aircrew fatigue are multiple night flight, multiple time zone displacement, flights departing 24 hours after an evening arrival and multiple takeoffs an landing. Additional aggravating factors include departure delay of several hours that require pilots to stay at airport, in-flight malfunctions, adverse weather, etc. Fatigue may be defined as a subjective state in which one feels tired or exhausted, and in which the capacity for normal work or activity is reduced [5]. The term fatigue has been used by psychiatrists in four different meanings:

1. A temporary decrease in efficiency resulting in work done without adequate rest.
2. A temporary decrease in efficiency resulting

from work, play or mental action of any sort without rest

3. A temporary decrease in efficiency resulting from work, disease, drugs or whatever cause
4. A complex of feelings [6].

Fatigue in Aviators

Although estimates vary, official statistics indicate that fatigue is involved in at least 4–8% of aviation mishaps, and surveys of pilots and aircrew members reveal that fatigue is an important concern throughout today's 24/7 flight operations [7]. Regulatory efforts aimed at limiting flight hours and ensuring at least minimal periods of crew rest have to some extent mitigated fatigue-related difficulties in the cockpit, but it is clear that much remains to be done about this insidious threat to air safety. Scheduling factors, sleep deprivation, circadian disruptions, and extended duty periods continue to challenge the alertness and performance levels of both short-haul and long-haul pilots and crews. Solutions for these problems are not straightforward, but they can be developed through the cooperative efforts of scientists, regulators, managers, and the pilots themselves [8].

Commercial pilots must contend with shift work and circadian rhythm disruption. Often, they also choose to commute long distances to work, so that by the time a work cycle starts they have already traveled for several hours. While a general aviation pilot may not have to deal with this, a busy lifestyle or other issues may lead to fatigue. Therefore, general aviation pilots must make every effort to modify personal lifestyle factors that cause fatigue [9].

Fatigue is the state of feeling tired, weary, or sleepy that results from prolonged mental or physical work, extended periods of anxiety, exposure to harsh environments, or loss of sleep. Boring or monotonous tasks may increase fatigue. As with many other physiologieal problems, crew members may not be aware of fatigue until they make serious errors. Sleep deprivation, disrupted diurnal cycles, or life-event stress may all produce fatigue and concurrent performance decrements. The types of fatigue are acute, chronic, and motivational exhaustion, or burnout [10].

Identifiable fatigue problems are reported by short-haul pilots, but this cannot be attributed solely to the work schedules of low-cost airlines as regular use of discretion time appears to be associated with fatigue regardless of airline [11]. For both Long Haul and Short Haul Flights, pilots reported acute fatigue related to sleep deprivation, mainly due to work schedules: night flights, jet-lag, and successive early wake-ups [12].

Personality and Fatigue

With regard to personality and fatigue, Michielsen et al [13] reported that high scores of extraversion are correlated with low scores of fatigue in people who work for more than 20 hours in a week. Martin et al [14] suggests that personality and physical activity are relevant predictors of fatigue and changes may be important for risk or resilience factors in late and very late life. Anxiety has a stronger influence on fatigue changes than does extraversion.

Wetherell *et. al.* [15], reported that personality traits such as neuroticism may serve as a source of increasing vulnerability among older adults. As a personality trait, anxiety in advanced later life may contribute to overall increasing fatigue and the loss of energy. One of the studies revealed that there is a significant correlation of anxiety trait of personality with physical, psychological and general fatigue [16].

Currently Indian aviation scenario is on a rapid growth and there are now sizeable aircrew population. With the increase in number of routes operated, it is prudent to have an insight on the

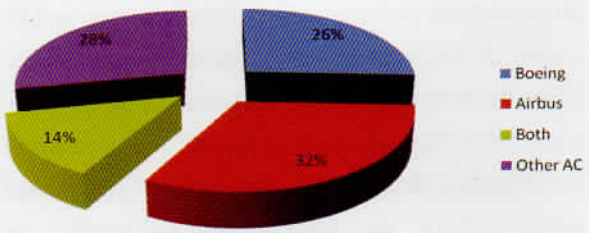

Figure 1. Aircraft Distribution

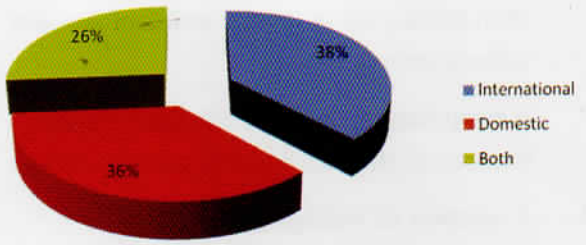

Figure 2. Sector Distribution

influence of personality traits over physical and mental fatigue. The findings of the study definately would have an impact in selection and training of aviators.

The perspective of association between personality, demographic data and fatigue has not been dealt in detail in Indian civil aviation scenario. Relatively little effort has been made, however, to address fatigue as a mental state. In this study, we conceptualized fatigue as a state characterized by a general lack of energy or vigor. Fatigue is considered as a continuous dimension that is experienced as a subjective internal feeling [17]. Therefore, we attempt to answer the following questions: Does personality have any association with fatigue? Do certain demographic variables like age and total flying hours, route, years of service have any relation with fatigue among civil aviators?

The primary aim of this study is to explore the personality domains that affect pilot's fatigue. The objective of the present study is to gather preliminary data on the relationship between personality and fatigue. Further effort is made to establish relationship between few demographic characteristics like age, total flying hours, years of service and routes of operation with fatigue among civil pilots using NEO-FFI [18] and Chalder's Fatigue Scale [17].

Materials and Method

53 civil pilots who reported to the institute for their annual medical examination participated voluntarily in the study. The researchers had informed the subjects that the personal details and organization to which they belong to, would be kept anonymous and data would be used only for research purpose. The pilots hailed from different cities in India. The demographic characteristics of the sample with respect to the type of aircraft flown by the pilot and the sectors operating are as depicted in the Figures 1 and 2 respectively.

Description of the psychological questionnaires

The Neo- FFI [18] contained 60 statements which give the indication of the extent of the presence of each of the five dimensions of personality in the individual. These five dimensions include Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness. The subjects were told to indicate how much they agreed or disagreed with each statement on a five point Likert scale from "strongly agree", "agree", "neutral", "disagree" and "strongly disagree", and mark the point in the scale. They were instructed to give their first and natural response to the statements and answer them truthfully and carefully. The NEO FFI gives an indication of the extent of the presence of each of the five dimensions of personality in the individual. These five dimensions include Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness. Neuroticism is defined as tendency to experience unpleasant emotions easily, such as anger, anxiety, depression, or vulnerability; sometimes called emotional instability. Extraversion is defined as

energy, positive emotions, surgency, and the tendency to seek stimulation and the company of others. Openness is appreciation for art, emotion, adventure, unusual ideas, imagination, curiosity, and variety of experience. Agreeableness is a tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others and conscientiousness is a tendency to show self discipline, act dutifully, and aim for achievement; planned rather than spontaneous behavior.

Chalder's Scale [17] consists of 14 items and a total score of fatigue can be obtained by adding all the items. There are two dimensions, physical fatigue (first 8 items) and mental fatigue (last 6 items). Likert system (0, 1, 2, and 3) of scoring was adopted. Four response options are used for giving responses: better than usual, no more than usual, worse than usual and much worse than usual. The total score ranges from 0-33.

Test Administration

A good rapport was first established with the pilot after which, the informed consent was taken. Subsequently the self reporting questionnaires of NEO-FFI, Chalder's Fatigue Scale, and Demographic Inventory were administered.

After preliminary scoring of the completed questionnaires, the data of 3 pilots were found to be incomplete and could not be considered for data analysis. Therefore the data of 50 pilots on these questionnaires were subjected to statistical analysis using the PASW Statistics 17 Package [19]. The descriptive statistics were drawn for the group on all the personality domains, fatigue variables and demographic characteristics. Further, Pearson's Product Moment Correlations were drawn to see the association between the personality domains and fatigue variables on the total sample. In order to have better understanding of the pilot's perception of fatigue dimensions across different age groups, years of service, total flying hours and routes of operation; the sample was categorized. The age in the sample is divided into three groups viz. early adulthood (20-35 yrs), middle adulthood (35-50 yrs), late adulthood (50-65 yrs) [20]. The years of service was classified as initial level (<5yrs), mid level (5-15 yrs) and senior level (15+ yrs) [21]. The total flying hours were grouped into first (<5000 hrs), second (5-15,000 hrs) and third (15,000+ hrs). The ultra-long and long range routes of operation constitute first group, normal & extended range are categorized as second group. The third group comprised of pilots who fly both ultra long and long as well as normal and extended routes.

ANOVA was applied to see if there is any significant difference in mean values on physical and mental fatigue dimensions of the pilots across the demographic characteristics viz. different age groups, years of service, total hours of flying and operating routes.

Results

The mean age of the sample is 41.68±11.2 yrs (n=50). The mean year of service is 14.27± 10.61 yrs (n=50) with an average of 7013.38±5821 (n=50) total flying hours. They had a mean educational qualification of 14.72±1.52 yrs.

The descriptive statistics of the sample on personality domains and fatigue dimensions are given in Table 1.

Table 1. Descriptive Statistics of the group on Personality, Fatigue variables (n=50)

Variables	Mean (Std. Deviation)
Neuroticism	15.74 (5.04)
Extraversion	30.38 (4.91)
Openness	27.00 (5.07)
Agreeableness	29.20 (4.73)
Conscientiousness	35.24 (5.95)
Physical Fatigue	15.16 (2.44)
Mental Fatigue	10.32 (2.33)

The descriptive data showed that the civil pilots were in an average range profile of the adult population norms on the domains of personality, except on neuroticism and agreeableness where the sample has obtained low scores [18]. The data also reveals that the sample manifests average levels of physical fatigue and mental fatigue.

Correlations were carried out between the domains of personality and physical and mental fatigue. Results indicated that there was a significant positive correlation ($r = 0.354$; $p < 0.05$) between openness and physical fatigue. (Fig3). Further a significant negative correlation ($r = -0.479$; $p < 0.01$) was obtained between conscientiousness and mental fatigue (Fig 4).

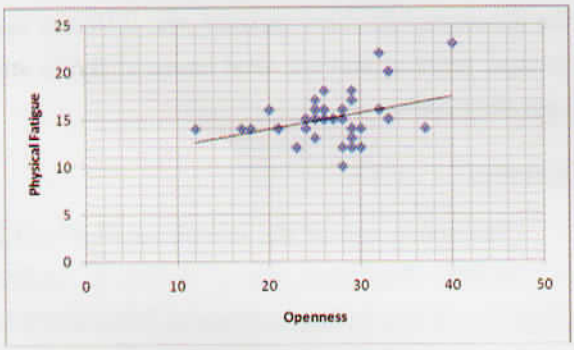

Figure 3. Openness and Physical Fatigue Scores

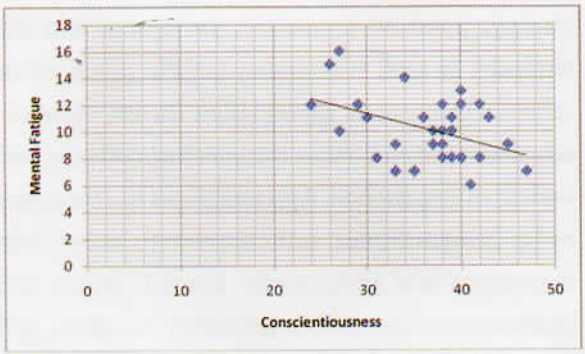

Figure 4 - Conscientiousness and Mental Fatigue Scores

One way Anova was carried out within different age groups, years of service, hours of flying and routes operating respectively on physical and mental fatigue. There was no significant difference found across the different groups.

Correlations were obtained to investigate if an individual's personality has any significant relationship over the physical and mental fatigue across the age groups, years of service, total flying hours and routes operating. The significant correlations thus obtained are depicted in Table 2.

In long and ultra-long range of flying, there was a significant positive correlation ($r = 0.682$, $p < 0.05$) between neuroticism and mental fatigue. In

Table 2: Correlation between personality domains and fatigue dimensions within demographic characteristics

Demographic Characteristics		Personality Domain	Fatigue Dimensions	Correlation(r value)
Age	Middle	Openness	Physical Fatigue	0.559**
		Conscientiousness	Mental Fatigue	-0.440*
	Late	Neuroticism	Mental Fatigue	0.603*
		Conscientiousness	Mental Fatigue	-0.559*
Years of Service	Middle	Openness	Physical Fatigue	0.473*
	Senior	Conscientiousness	Mental Fatigue	-0.614**
Total hours of Flying	<5000	Openness	Physical Fatigue	0.535**
		Conscientiousness	Mental Fatigue	-0.476*
	5000-15000	Agreeableness	Physical Fatigue	-0.486*
		Conscientiousness	Mental Fatigue	-0.497*
	15000+	Neuroticism	Mental Fatigue	0.937*

*p< 0.05 **p<0.01

the same group, a significant negative correlation ($r = -0.634$, $p < 0.05$) between conscientiousness and physical fatigue as well as negative correlation ($r = -0.624$, $p < 0.05$) between conscientiousness and mental fatigue was observed. In the normal and extended range of flying, there was a significant negative correlation ($r = -0.381$, $p < 0.05$) between extraversion and physical fatigue as well as significant negative correlation ($r = -0.624$, $p < 0.01$) between conscientiousness and mental fatigue. In the third group, a significant positive correlation ($r = 0.751$, $p < 0.05$) between openness and physical fatigue was observed.

Discussion

The descriptive scores on the dimensions of personality indicate that civil pilots have low neuroticism and agreeableness which means pilots perceive themselves as generally secure, relaxed even under stressful conditions and are hardy. Further they are also perceived to be hard headed, skeptical, proud and competitive [18]. These are in concurrence with early findings of Fitzgibbons et al [2]. The descriptive scores on fatigue dimensions indicate average levels of physical and mental fatigue among civil pilots.

The positive correlation between openness and physical fatigue could be interpreted to the variety of experiences embedded in the aviation environment, willingness to take risks and venturesome nature of pilots. This characteristic of being hands-full may have a profound influence on the physical energies of the individual. The negative correlation between conscientiousness and mental fatigue reflects that pilot's adherence to the rules, procedures, protocols and proceeding with a well planned work schedules perhaps instills a sense of safety, therefore he is able to maintain the vigor for long durations and is in control of the situation.

As stated, the analyses of ANOVA yielded non-significant results. This shows that the sample is homogenous on the perceived levels of fatigue dimensions.

An individual's personality will have an influence on the dimensions of fatigue as compared to other relevant aspects like age, years of experience, total flying hours and route of operations. The results reflected that physical fatigue to some extent is related to age. In the present sample, the personality aspects of early adulthood are not found to have any significant relationship with the physical or mental fatigue. This could be attributed to their physical stamina. In middle adulthood, the correlations are in line with the results of the entire sample. The positive correlation between neuroticism and mental fatigue in late adulthood implies the vulnerability and emotional instability. This could be due to their apprehensions regarding retirement, family, health and overall slowing down of dynamic processes in human body. The findings are in accordance with the research made by Wetherell et al. [15, 16]

In the initial years of service, the personality aspects are not found significant with fatigue levels. This could be attributed to their enthusiasm towards flying and their physical stamina concurring with findings of early adulthood analysis. The positive correlation of openness and physical fatigue in the mid group and the negative correlation of conscientiousness and mental fatigue in the senior group follows similar pattern of the entire sample.

The first group with <5000 hrs of flight are in agreement with the findings of the entire sample. The pilots are in their learning curve of their career and it is essential for them to strictly comply to the rules. The second group with 5000 to 15000 hrs experience has negative correlation between agreeableness and physical fatigue. As pilots

become more compassionate towards others and less competitive in nature, they would have developed a strong support system with family and peers. This mutual 'sharing and caring' attitude helps them to sustain the energy levels. The positive correlation between neuroticism and mental fatigue in third group (15000+ hours) substantiates our earlier findings of the relationship of personality on fatigue dimensions in the late adulthood.

In the long and ultra-long range of routes, the negative correlation of conscientiousness with both physical and mental fatigue shows that pilots must follow the laid down procedures, meticulously plan their flight so as to sustain their energy and vigor for long duration. The negative correlation between extraversion and physical fatigue in the normal & extended range group implies that pilot with more positive emotions, seeking company of others experience less physical fatigue. This findings corroborates with the study of Michielsen et al and Martin et al [13, 14].

Although personality domain seems to play a role in fatigue dimensions, it is difficult to draw general conclusions on the relation between personality and fatigue. The findings of this study cannot be considered definitive due to a small sample size. The use of an abbreviated personality inventory may have influenced the results. Acknowledging these limitations, the findings of this research are based on a small, representative sample on which self reported data was collected.

Conclusion

Fatigue is a state characterized by a general lack of energy or vigor. There is a significant correlation of anxiety trait of personality with physical, psychological and general fatigue. The objective of the present study is to gather data on the relationship between personality and fatigue.

Results indicate that pilots perceive to have average levels of physical and mental fatigue. The positive correlation between openness and physical fatigue reveals that the pilots who identify their career as a demanding profession rather than being enthusiastic and appreciating their vocation experience high fatigue and depleted energies. The negative correlation between conscientiousness and mental fatigue indicates pilot's adherence to the rules, procedures, protocols and thus experience less fatigue. This tendency is likely to help the aviators, therefore airline industry must adopt strict measures so that pilots comply to the laid down procedures, maintaining high standards of work and ensuring safe passage. It is imperative for the airline industry to focus on personality aspects during selection and training programs of pilots. The personality traits and demographic characteristics must be borne while assigning flying duties.

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