

A Comparison of Personality Characteristics Between University Aviation Students and Airline Pilots

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Abstract

This study represents the first phase of a multiphase project to develop a model for selecting and assessing professional pilot applicants into a university aviation flight program. Using the NEO-PI, the present study compares the personality characteristics of freshmen enrolled in the introductory aviation course with students in a third-year flight courses (persistors), and pilots employed by a major U.S. carrier. Significant differences were found between students in the freshman and junior courses, between male and female students, and between students and the line pilots. Significant correlations were found between grade point averages and scores on the NEO-PI.

Introduction

With the decreasing number of pilots being produced by a down-sized military and a declining general aviation sector, the U.S. airline industry will be looking to other sources of qualified pilots. Certainly as we approach the next decade, collegiate aviation programs will increasingly be called upon to educate the future pilot population. It is also likely that this educational shift will be accompanied by a reevaluation of the methods presently used for pilot selection and training.

Pilot selection procedures in the airline industry have traditionally emphasized psychomotor and technical skills. Personality assessment has been used primarily to screen out undesirable candidates rather than to select optimal candidates. For example, the U.S. airline industry has relied on clinical personality assessment tools, such as the Minnesota Multiphasic Personality Inventory (MMPI). While these instruments may be appropriate for the clinical diagnosis required for therapy, most pilot applicants do not suffer from behavioral disorders.

The authors believe a better approach would be the use of a personality instrument that discriminates within the normal range of behavior--one that reveals information about critical work-related traits and can, in turn, be linked to academic and operational performance. Especially significant to this theoretical foundation is the evidence indicating that the effectiveness of airline crews is a product of not only technical skills and attitudes, but also the more stable personality traits of the crew members (Chidester, Helmreich, Gregorich & Geis, 1991; Hormann & Maschke, 1993).

The NEO Personality Inventory

The NEO-PI was developed to operationalize the five-factor model of personality. Factors are defined by groups of intercorrelated traits. Specific

traits are referred to as facets and each cluster of facets is termed a domain. The NEO-PI has five domain scales: Neuroticism, Extroversion, Openness, Agreeableness, and Conscientiousness. Within each domain there are six facet scales, as listed below:

1. Neuroticism: Anxiety, Angry Hostility, Altruism, Self-Consciousness, Modesty, Vulnerability.
2. Extraversion: Warmth, Gregariousness, Assertiveness, Activity, Excitement-Seeking, Positive Emotions.
3. Openness: Fantasy, Aesthetics, Feelings, Actions, Ideas, Values.
4. Agreeableness: Trust, Straightforwardness, Altruism, Compliance, Modesty, Tender-Mindedness.
5. Conscientiousness: Competence, Order, Dutifulness, Achievement Striving, Self-Discipline, Deliberation.

The NEO-PI personality inventory was selected for use in this study because of the focus on normal behavioral traits and the predictive value of several NEO scales with occupational performance (Barrick and Mount, 1991).

Purpose of the Study

This study represents the first phase of a multiphase project to develop a model to select professional pilot applicants into a university aviation flight program. The research presented here has two objectives. The first is to determine if the personality profile of freshmen enrolled in an introductory aviation course is significantly different from the personality profile of persistors, those students enrolled in third-year flight courses. The second objective is to determine if there are any significant differences between the university students and a selected sample of 20 pilots employed by a major U.S. carrier.

The researchers were also interested in analyzing differences in the student population based on demographic factors, such as gender and degree objective, and examining the relationship between personality dimensions and academic success.

Method

The self-report version of the Revised NEO Personality Inventory (NEO-PI-R) was administered to 142 students who were enrolled in four-year aviation degree programs at a U.S. university. The degree programs included professional pilot, aviation maintenance management, aircraft maintenance engineering technology, and aviation technical management. The first student group was comprised of 92 aviation majors enrolled in the freshman introductory aviation course. Of this group, the majority--69 students--were professional pilot majors. The second student group was comprised of 50 professional pilot majors enrolled in one of three third-year (junior) flight courses. The third group in this study was a selected sample of 20 pilots employed by a major U.S. carrier.

Results

The scores of the 142 aviation students were plotted on the NEO profile form to get a general sense of these students relative to the normative groups by gender. Male and female scores were plotted on the corresponding profile sheet. Both male and female students were higher than the normative group on Extraversion. This can be accounted for primarily by the higher score on Excitement Seeking facet of this dimension for both groups. Interestingly, in the Conscientiousness domain, both male and female students scored slightly lower on the Dutifulness facet than the normative group and the males also scored lower in the Self-Discipline facet in this domain.

The t-test for independent samples was used to compare the scores of students enrolled in the freshman course with students enrolled in the junior flight courses. We have used the term persistors to describe the latter group since these students have persisted in their academic career. As can be seen in Table 1, significant differences were found in three domains: Neuroticism, Extraversion, and Conscientiousness. The greatest differences were found in the Neuroticism domain. Students enrolled in the freshman course are more prone to feelings of guilt and sadness (Depression), inferiority (Self-Consciousness), and less able to cope with stress (Vulnerability) than students enrolled in the junior course. The persistors were significantly more forceful and dominant (Assertiveness) and feel more capable and effective (Competence) than the first-year students.

Table 1
Comparison of Students in a Freshman Course with Students in Junior Courses on NEO-PI Scales

Domain/Facet	Freshman (n= 92)	Junior (n= 50)
Neuroticism **	88.5	77.7
Depression **	15.6	11.9
Self-Consciousness **	16.2	13.5
Vulnerability **	11.0	8.3
Extraversion *	119.0	126.1
Assertiveness **	16.9	19.2
Competence **	21.1	23.0

* <.05 ** <.01

NOTE: In all the tables presented in this paper, domain scales are distinguished from facet scales by capital letters.

When the professional pilot majors enrolled in both the freshman and junior courses were compared, the only significant differences were in the Neuroticism domain. As Table 2 indicates, the persistors scored lower on the Depression, Self-Consciousness, and Vulnerability scales.

Table 2
Comparison of Pilot Majors in Freshman Courses With Pilot Majors in Junior Courses on NEO-PI Scales

Domain/Facet	Freshman (N= 61)	Junior (N= 50)
Neuroticism *	87.2	77.7
Depression **	15.3	11.9
Self-Consciousness *	15.8	13.5
Vulnerability **	10.6	8.3

* <.05 ** <.01

While there were only 23 non-pilot majors in the sample, the scores between the professional pilot and non-pilot majors were compared. This comparison is presented in Table 3. The non-pilot majors were more self-conscious and, interestingly, their scores suggested this group is less friendly and affectionate, less assertive, and less likely to experience positive emotions than the pilot group.

Table 3
Comparison of flight majors with non-flight majors on NEO-PI scales

Domain/Facet	Flight (n= 111)	Non-Flight (n= 23)
Self-Consciousness *	14.8	16.9
Extraversion *	123.9	113.1
Warmth *	23.2	21.0
Assertiveness *	18.4	16.0
Positive Emotions *	21.0	18.9

* <.05

The authors were also interested in the differences in scores based on gender. As Table 4 illustrates, the female aviation students are significantly more anxious than their male counterparts and more prone to feelings of guilt, hopelessness, and loneliness. However, these women also have a deeper appreciation for art and beauty (Aesthetics), are more willing to try different activities or new experiences (Actions), and more readily reexamine social, political, and religious values (Values) than the male students.

Table 4
Comparison of Male Students with Female Students on the NEO-PI Scales

Domain/Facet	Males (n= 116)	Females (n= 23)
Anxiety *	15.6	17.9
Depression *	13.8	16.3
Openness *	111.5	120.6
Aesthetics *	16.3	19.0
Actions *	16.3	18.0
Values **	19.9	22.6
Agreeableness *	113.5	122.0
Straightforwardness *	18.2	20.3
Tender Mindedness *	19.2	21.3

* <.05 ** <.01

In addition, there were significant differences between the male and female students in the Agreeableness domain. The significantly low scores on the Straightforwardness facet suggest that male students are more willing to manipulate others through flattery, craftiness, or deception than are female students. The lower scores on the Tender-Mindedness facet indicate that the male students are both more hardheaded and hardhearted than the female students.

Because there is some evidence to suggest that a relationship exists between academic and occupational success and the traits associated with Openness (McCrae, 1987) and traits associated with Conscientiousness (McCrae & Costa, 1987), the correlations between the grade point average of the persistors and the NEO-PI scales were analyzed. The results of this analysis are presented in Table 5. All correlation coefficients are presented in the table, but the probability levels are presented for only those coefficients significant at the .05 level.

Table 5
Correlations Between Grade Point Averages of Persistors on NEO-PI scales

Domain/Facet	r
Depression	-.29 (p=.038)
Impulsiveness	-.38 (p=.007)
Aesthetics	-.34 (p=.017)
Trust	.29 (p=.042)
Straightforwardness	.32 (p=.025)
Conscientiousness	.44 (p=.001)
Competence	.44 (p=.001)
Order	.28 (p=.048)
Dutifulness	.33 (p=.020)
Achievement Striving	.38 (p=.007)
Self-Discipline	.29 (p=.041)
Deliberation	.40 (p=.004)

The highest correlations--in number and significance--are between grade point average and the Conscientiousness domain and all six facets within this domain: Competence, Order, Dutifulness, Achievement Striving, Self-Discipline, and Deliberation. Moderately high positive correlations were also found between grade point average and both Trust and Straightforwardness in the Agreeableness domain. There are moderately high negative correlations between two facets in the Neuroticism domain, Depression and Impulsiveness, and the Aesthetics facet in Openness.

The t-test for independent samples was used to compare the scores of the students who were professional pilot majors with the airline pilots. As can be seen in Table 6, there were significant differences between these groups in the Neuroticism domain and in all six facets in this domain, the students scoring higher than the pilots on Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness, and Vulnerability. The students also scored significantly higher on the Excitement-Seeking facet in the Extraversion domain. The students also scored significantly lower on the Agreeableness dimension and on Trust, Straightforwardness, and Compliance in that domain. They were significantly lower on Conscientiousness and five of the six facets in that domain: Competence, Dutifulness, Achievement Striving, Self-Discipline and Deliberation.

Table 6
Comparison of Pilot Majors and Airline Pilots

Domain/Facet	Students (n= 111)	Pilots (n= 20)
Neuroticism **	82.9	57.3
Anxiety **	16.0	10.8
Angry Hostility **	13.2	8.7
Depression **	13.8	7.9
Self-Conscious **	17.8	11.2
Impulsiveness **	15.7	13.0
Vulnerability **	9.6	5.7
Excitement-Seek **	22.1	18.0
Agreeableness *	115.6	125.9
Trust **	19.1	22.9
Strtforwardness **	18.9	21.8
Compliance **	17.1	19.8
Conscientiousness **	120.0	139.9
Competence **	22.2	25.6
Dutifulness **	21.4	25.4
AchStriving **	20.7	23.2
Self-Discipline **	19.7	24.6
Deliberation **	17.0	20.8

* <.05 ** <.01

Conclusions and Discussion

Overall, the aviation students included in the study scored higher on Excitement-Seeking than the normative group. Professional Pilot majors who had persisted to their junior year of course work scored lower on Neuroticism and on the Depression, Self-Consciousness, and Vulnerability facets within that domain than students in the freshman course. The female students scored higher on Anxiety and Depression, higher on Openness and several facets within that domain, and higher on both Straightforwardness and Tender-Mindedness than the male students.

Barrick and Mount's (1991) meta-analysis of 117 criterion-related validity studies examined the relation of the five personality factors to job proficiency, training proficiency, and personnel data for a wide range of occupational groups. Since the ultimate goal of our larger research project is to be able to better predict the academic and occupational success of pilot candidates, Barrick and Mount's findings provide an interesting comparison.

Barrick and Mount found the Conscientiousness dimension to be a consistently valid predictor of training proficiency and job proficiency across the wide range of occupational groups included in their study. Our research supports their findings--grade point average was highly correlated with the Conscientiousness domain and with all six facets within this domain.

Another finding in Barrick and Mount's meta-analysis was that Openness to Experience was a valid predictor of training proficiency but not job proficiency. They theorize that individuals with high scores on this dimension have a more positive attitude toward learning experiences. It is also this dimension which has the highest correlation of any of the personality dimensions with measures of cognitive ability (McCrae & Costa, 1987). It is interesting, then, that in the present study there is little relation between grade point average and the Openness domain or any of the facets within Openness. More surprising, with the exception of Values, the relationships are negative.

Extraversion was also found to be a predictor of training proficiency. This scale, Barrick and Mount suggest, may in fact differentiate between active and passive learners. While in the present study the correlations between Extraversion and grade point average were relatively low, it is worth noting that the persistors scored significantly higher on Extraversion than the students enrolled in the freshman course.

This study has potentially important implications for pilot selection and training. First, our findings support the notion that there is a strong relationship between the Conscientiousness personality dimension and academic success, as measured by grade point average. Second, the finding that persistors scored significantly higher on Extraversion than students enrolled in the freshman course may also provide additional insight into the personality dimensions associated with academic success. Another intriguing finding is the significant differences between the students and airline pilots. More research is needed to explain these differences.

References

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