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THE NEO PI-R AS A PREMORBID BASELINE MEASURE



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14. ABSTRACT The United States Air Force (USAF) uses measures of personality based on the Big Five model when psychologically assessing pilots. The <i>Revised NEO Personality Inventory</i> (NEO PI-R), a “Big Five” measure, includes <i>Neuroticism</i> , <i>Extraversion</i> , <i>Openness to Experience</i> , <i>Agreeableness</i> , and <i>Conscientiousness</i> and is used as the operational assessment tool when considering issues of suitability. This study compared data from a large USAF pilot sample to the nationally representative normative population to support the use of both sets of norms in clinical evaluation. Specifically, this study examined differences in descriptive statistics, correlations, and factor structures between the sample from USAF pilots and the commercially published norms. Comparisons using gender norms were made in addition to comparisons using combined norms. An initial sample of 12,702 USAF pilot training candidates was administered the <i>NEO PI-R</i> prior to the 53 weeks of Specialized Undergraduate Pilot Training. All USAF pilot training candidates were either college graduates or enrolled in college and nearing graduation; many had private pilot licenses or had completed some portion of private pilot license training including flight hours in light aircraft. Results demonstrated that the factor structures were similar, indicating that the test is measuring the personality constructs of interest. Correlations among the domain scores were different, and the means for some domain and facet scores were different, indicating that the pilot sample should be considered in addition to national norms for clinical evaluation. These important differences argue for the compilation of a comprehensive set of pilot norms to be used by clinicians performing personality assessments of pilots.					
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1.0 SUMMARY

The United States Air Force (USAF) uses measures of personality based on the Big Five model when psychologically assessing pilots. The *Revised NEO Personality Inventory* (NEO PI-R), a “Big Five” measure, includes *Neuroticism*, *Extraversion*, *Openness to Experience*, *Agreeableness*, and *Conscientiousness* and is used as the operational assessment tool when considering issues of suitability. This study compared data from a large USAF pilot sample to the nationally representative normative population to support the use of both sets of norms in clinical evaluation. Specifically, this study examined differences in descriptive statistics, correlations, and factor structures between the sample from USAF pilots and the commercially published norms. Comparisons using gender norms were made in addition to comparisons using combined norms. An initial sample of 12,702 USAF pilot training candidates was administered the NEO PI-R prior to the 53 weeks of Specialized Undergraduate Pilot Training. All USAF pilot training candidates were either college graduates or enrolled in college and nearing graduation; many had private pilot licenses or had completed some portion of private pilot license training including flight hours in light aircraft. Results demonstrated that the factor structures were similar, indicating that the test is measuring the personality constructs of interest. Correlations among the domain scores were different, and the means for some domain and facet scores were different, indicating that the pilot sample should be considered in addition to national norms for clinical evaluation. These important differences argue for the compilation of a comprehensive set of pilot norms to be used by clinicians performing personality assessments of pilots.

2.0 INTRODUCTION

The United States Air Force (USAF) uses measures of personality based on the Big Five model in the psychological assessment of pilots. The *Revised NEO Personality Inventory* (NEO PI-R) (Ref 1), a “Big Five” measure composed of the domains *Neuroticism*, *Extraversion*, *Openness to Experience*, *Agreeableness*, and *Conscientiousness*, is the operational assessment tool. This study compared data from a large USAF pilot sample to the nationally representative normative population to evaluate the use of both in clinical assessments.

While there have been many definitions of personality, a common definition describes personality in terms of enduring traits that lead to behavior (Ref 2). They define personality traits as “...stable, deep-seated predispositions to respond in particular ways. Personality is reflected in behaviors that are relatively stable over time and consistent across situations” (Ref 2, p. 27).

2.1 Empirical Personality Research

Over the past 50 years, the study of personality has made substantial empirical progress, confirming the construct validity of personality measures (for a more detailed historical perspective and detail of previous empirical research on personality, see Ref 3,4). The past half century has also seen the development of more valid personality inventories. Moreover, the relationships of personality constructs to important outcome variables have been examined. Several studies have confirmed the existence of five personality factors, known as the Big Five (Ref 5-7). Goldberg’s lexical theory (Ref 8) served as the foundation for Costa and McCrae’s

NEO Personality Inventory (Ref 1), which measures *Neuroticism*, *Extraversion*, *Openness to Experience*, *Agreeableness*, and *Conscientiousness*. Subsequent research has established the use of personality measures in the prediction of occupational outcomes, including training performance and job performance (Ref 9,10). In addition, *Extraversion* has been found to be a valid predictor for those employed in sales or in a management role because social interaction is required (Ref 9). *Conscientiousness* and *Extraversion* showed greater validity for managers in high-autonomy jobs than in low-autonomy jobs (Ref 11), while managers who scored high on *Extraversion* were likely to use an inspirational approach when trying to influence others (Ref 12). In summary, Barrick, Mount, and Judge noted: “Results support the previous findings that conscientiousness is a valid predictor across performance measures in all occupations studied” (Ref 13, p. 9).

2.2 Aviation-Related Personality Research

Personality testing in aviation has included the examination of relationships of personality with training outcomes, comparisons of scores on different aircraft, identification of pilot personality types, comparisons of male and female pilots to nonpilots, and, importantly, comparisons of pilot data to the normative population or other baseline groups.

The largest body of research on personality testing with pilot samples has examined personality relationships with training outcomes. Early research on the use of personality tests for flying personnel at the School of Aerospace Medicine showed the utility of the personality constructs of “motivation to fly” and “expression of anxieties about flying” (Ref 14). Siem (Ref 15) showed the validity of personality measures in pilot selection, with hostility ($r = -.12$), self-confidence ($r = .13$), and values flexibility ($r = .12$) found to be predictive in a sample of 500 student pilots. In addition, the relationships between the Big Five scales as measured by the NEO PI-R and success in flying training in a high-wing, propeller-driven monoplane were studied by Anesgart and Callister (Ref 16). They reported evidence that *Neuroticism*, *Extraversion*, and *Openness to Experience* were related to self-elimination from the program. No other scores of the Big Five were predictive. Furthermore, several meta-analyses have been conducted to estimate the relationship between personality and flying training criteria. Hunter and Burke (Ref 17) conducted a meta-analytic study that revealed a small correlation of $r = .10$ for personality as a predictor of flying training criteria. Martinussen (Ref 18) conducted a second meta-analysis and found a correlation of $r = .14$ with a pass/fail criterion. More recently, Campbell, Castaneda, and Pulos (Ref 19) performed a meta-analysis on 26 studies examining the effects of personality as a predictor of pilots’ outcomes in aviation training. Two higher order personality domains (*Neuroticism* and *Extraversion*) and one lower order facet of *Neuroticism* (*Anxiety*) were found to have an impact on training success. The authors reasoned that emotionally stable, extroverted individuals would be better able to undergo the stress of aviation training. Finally, in aviation-related research on personality, a series of three studies demonstrated the uses of personality assessment methods for selection of Federal Aviation Administration air traffic control specialists (Ref 20).

Another study found three distinct personality types among USAF pilots (Ref 21). Based on a sample of 350 pilot trainees, they identified three bipolar profiles: (1) high histrionic, narcissistic, and antisocial; (2) moderate narcissistic, histrionic, and high compulsivity; and (3) high compulsivity and low histrionic.

A recent study compared personality scales for USAF pilots flying different aircraft. Significant differences between the scores of pilots assigned to fly airlift/tankers and fighter pilots were found by Boyd, Patterson, and Thompson (Ref 22) for the NEO domains of *Agreeableness* and *Conscientiousness*. Fighter pilots had lower levels of *Agreeableness* and higher levels of *Conscientiousness*. The authors noted that the homogenous scores prevented any practical application. While Siem (Ref 15) lauded the role of conscientiousness in aviation, King, Orme, and Retzlaff (Ref 23) found that pilots with higher levels of the NEO PI-R *Conscientiousness* facets of *Competence* and *Dutifulness* were at increased risk to experience a pilot-error mishap or incident.

Several studies made comparisons of male and female pilots to nonpilots, and, importantly, some compared pilot data to the normative population. Novello and Youssef (Ref 24) investigated the personalities of female pilots and found them to be more like male pilots than female nonpilots. King, McGlohn, and Retzlaff (Ref 25) reported that, compared to male pilots, USAF female pilots scores were approximately one-half standard deviation higher on *Agreeableness* and *Conscientiousness*. Callister, King, Retzlaff, and Marsh (Ref 26) produced descriptions of the personalities of 1,098 male and 103 female student pilots by means of scores on the NEO PI-R. Both genders scored high on *Extraversion* and low on *Agreeableness*. Female student pilots also had higher scores on *Openness to Experience* compared to the female population. In a comparison of female pilots to male pilots and to the female normative sample on the NEO PI-R, differences were found on all personality measures except *Conscientiousness*. Finally, Chappelle, Novy, Sowin, and Thompson (Ref 27) evaluated psychological baseline test scores from the NEO PI-R on USAF female and male pilots. The intent of the study was to provide modern normative data on the personality traits of current USAF pilots. They also identified personality traits that distinguished female pilots from male pilots and from nonpilot females in the civilian normative sample. Female pilots scored higher on *Conscientiousness* than the female normative sample but very slightly less than the male pilots. These results were generally consistent with the previous studies. This study illustrates the importance of using appropriate and meaningful baseline data that assist clinical psychologists with the interpretation of NEO PI-R psychological test scores.

In the more clinical realm, assessing fitness rather than suitability, King (Ref 28) compared military aviators who were psychiatrically assessed to have maladaptive personalities to aviators deemed to be free from personality pathology using the *Millon Clinical Multiaxial Inventory* (MCMI). The MCMI scales were statistically different for identifying *Diagnostic and Statistical Manual of Mental Disorders* Cluster C (dependent or avoidant or both) maladaptive personality traits but were not statistically significant for Cluster B (histrionic or narcissistic or both) traits. This points to the importance of making comparisons of aviators with maladaptive personalities to a similar known group (aviators free from personality pathology) rather than to the general population.

In summary, there are important differences in personality measures. These include male-female differences, differences between pilots and the normative sample, as well as differences with other comparison groups. These differences suggest the need to consider different comparison groups when conducting clinical evaluations.

2.3 Purposes of the Study

This study compared data from a large USAF pilot sample to the nationally representative normative population to explore differences between these data sources and to determine the need for supplemental norms during clinical evaluation. Specifically, this study examined differences in descriptive statistics, correlations, and factor structures between the pilot sample and normative population, including male versus female comparisons.

3.0 METHOD

3.1 Participants

An initial sample of 12,702 pilot training candidates was administered the NEO PI-R prior to the 53 weeks of Specialized Undergraduate Pilot Training. All were college graduates or were near completion of college; many had private pilot licenses or had completed some portion of private pilot license training including flight hours in light aircraft. Of the participants reporting demographic information, all were under the age of 36 years, with a modal age of 22 years, mean age of 24 years, and standard deviation of 2.6 years. They were 93% male and 7% female. Ethnic and racial distributions indicated that 92% were white, 4% were Hispanic, 2% were African American, and 2% were “other.” All were tested at the School of Aerospace Medicine at Brooks City-Base, TX, or at the U.S. Air Force Academy in Colorado Springs, CO. Sample sizes vary for particular analyses as a function of missing data for certain variables.

3.2 Measures

The NEO PI-R measures five major personality domains and the facets or traits that underlie each domain. The five domains are *Neuroticism*, *Extraversion*, *Openness to Experience*, *Agreeableness*, and *Conscientiousness*. Each domain consists of six facet scores. These domains and facets provide a comprehensive measurement of adult personality (Ref 1).

The NEO PI-R was developed as a multipurpose personality inventory for predicting many criteria such as behaviors related to illness, career interests, psychological health, and styles of coping (Ref 1). It contains 240 statements that require subjects to respond on a Likert-type scale, ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). Table 1 shows a description of the five domain scales as well as their reliabilities in a sample of 1,539 men and women in a large organization. Reliability coefficients for the 30 facets are reported in the test manual and range from .56 to .81 (Ref 1). For the current study, the normative sample for adults served as the normative reference, and the test was administered and scored via computer (Ref 1).

Table 1. Domain Definitions and Reliabilities of the NEO PI-R

Test	Definition	Reliability ^a
<i>Neuroticism (N)</i>	The tendency to experience negative emotions (anger, sadness, fear) and be emotionally unstable	.92
<i>Extraversion (E)</i>	The enjoyment of social situations, excitement, and stimulation	.89
<i>Openness to Experience (O)</i>	A willingness to explore new ideas and values; desire for aesthetics	.87
<i>Agreeableness (A)</i>	The desire to sympathize with and help others	.86
<i>Conscientiousness (C)</i>	Seeking a high level of organization and planning; the tendency to plan carefully and exercise self-discipline	.90

^aReliability estimated through internal consistency using coefficient alpha for a developmental sample of 1,539 respondents (Costa & McCrae, 1985).

3.3 Procedure

The first analysis compared the mean and variability of the sample of pilots to the normative sample. Provided next are descriptive statistics for all five domains of the NEO PI-R from the pilot sample raw scores. Distributional statistics were computed for the total group of pilots and for males and females separately for the facets of the NEO PI-R. Next, percentile equivalents were computed for the raw scores in each domain for males, females, and the combined sample. These comparisons were also performed for each of the facet scores within a domain. Correlations were computed and compared to the normative correlations as presented by the NEO PI-R manual. These correlations were evaluated and categorized using Cohen's *d*. Replicating the method presented by the publisher in the test manual, a factor analysis was performed using principal components with varimax rotation with the extraction of five factors. These results were then compared to the results presented in the manual.

4.0 RESULTS

Three sets of analyses were conducted comparing the pilot sample and the nationally representative normative sample. The first set of analyses compared the descriptive statistics (e.g., means and standard deviations) of the two samples. The second set of analyses compared the correlations of the two samples. The third set of analyses compared factor analytic results of the two samples.

4.1 Comparison of Descriptive Statistics

Table 2 displays the results of the first analysis comparing the means and standard deviations (SDs) of the two samples. Results are presented for pilots and the normative sample for males, females, and the combined sample. The means and standard deviations are calculated

from raw scores. A comparison of the descriptive statistics for male and female pilots to the normative sample can be found in Chappelle et al. (Ref 27). Additional descriptive analyses, including skewness and kurtosis, can be found in Appendix A. Specific tables for the domains and facets converting raw score to percentiles for pilots can be found in Appendix B.

Overall, for the combined sample, there were differences at the domain level but negligible differences for most of the facet scores. Pilots scored lower on *Neuroticism* and *Agreeableness* and higher on *Extraversion*, *Openness to Experience*, and *Conscientiousness*. Some of the pilot norm group comparisons were more dramatic for females than males. For example, female pilots scored much higher on *Extraversion* and *Openness to Experience* than females in the normative sample. Overall, there were small differences between pilot and normative data for standard deviations.

4.2 Comparison of Correlations

The second set of analyses compared correlations among domain scores of the pilot sample to the normative sample. The following standards suggested by Cohen (Ref 29) were adopted for interpretation of all correlations. Correlations were divided into three groups based on Cohen's *d*, a measure of effect size. Correlations categorized as *small* had an effect size, *d*, of .10 to .49, corresponding to an *r* of .05 to .23. *Medium* correlations had effect sizes of .50 to .79, corresponding to correlations of .24 to .36. *Large* effect sizes were .8 or greater, corresponding to correlations equal to or greater than .37. See Table 3.

Table 4 displays the correlations of the five NEO PI-R domains for the sample of 12,702 pilots and the 1,000 men and women in the normative sample reported in the manual. The pilot sample correlations are reported below the matrix diagonal, and the normative sample correlations are reported above the matrix diagonal.

In the pilot sample, all of the correlations among the NEO PI-R domains can be classified as *small*, with the highest correlation between *Agreeableness* and *Openness to Experience* ($r = .16$). In the normative sample, one correlation was classified as *large* (*Neuroticism* and *Conscientiousness* at $r = -.53$). Four correlations were classified as *medium* and five as *small*.

Table 5 displays the absolute differences between the pilot and normative samples in the NEO PI-R domain pairs below the matrix diagonal. The classification of correlations based on Cohen's *d* is reported above the diagonal. The largest absolute difference between the pilot and normative samples was between *Neuroticism* and *Conscientiousness* ($r = .58$). Three differences were classified as *large*, two as *medium*, and five as *small*.

Table 6 displays the correlations from the NEO PI-R facets. The intercorrelations among the facets from the normative sample can be found in Appendix F of the NEO PI-R manual.

4.3 Comparison of Factor Structures

The third set of analyses compared the factor structures of the pilot sample to the normative sample. Table 7 displays the factor loadings of the NEO PI-R facets. Loadings greater than or equal to .4 are in bold font. The factor loadings from our pilot sample are very similar to those found in Table 5 of the NEO PI-R manual.

Table 2. Descriptive Statistics for All Domains and Facets of the NEO PI-R in the Pilot and Normative Sample^a

Domains/Facets	Male						Female						Combined					
	Pilots			Norm			Pilots			Norm			Pilots			Norm		
	Mean	SD		Mean	SD		Mean	SD		Mean	SD		Mean	SD		Mean	SD	
Neuroticism																		
N1: Anxiety	67.88	18.39		75.2	19.9		74.01	20.81		83.1	21.7		68.34	18.65		79.1	21.2	
N2: Angry Hostility	12.19	4.51		13.3	4.9		14.06	4.85		15.4	5.4		12.33	4.56		14.3	5.3	
N3: Depression	11.78	4.44		12.2	4.5		11.93	4.63		12.6	4.8		11.80	4.46		12.4	4.6	
N4: Self-Consciousness	9.97	4.30		11.6	5.2		10.86	4.99		12.9	5.6		10.04	4.36		12.3	5.4	
N5: Impulsiveness	12.58	4.25		13.7	4.3		13.38	4.65		15.0	4.5		12.64	4.28		14.3	4.4	
N6: Vulnerability	14.69	4.44		15.3	4.2		15.78	4.84		16.3	4.6		14.78	4.47		15.8	4.4	
	6.66	3.25		9.2	3.7		7.99	3.43		10.9	4.0		6.76	3.28		10.0	3.9	
Extraversion																		
E1: Warmth	127.68	17.15		108.5	18.5		132.69	17.19		110.3	18.4		128.01	17.20		109.4	18.4	
E2: Gregariousness	23.11	3.88		22.3	4.0		24.44	3.96		23.6	3.8		23.20	3.90		22.9	4.0	
E3: Assertiveness	19.01	5.01		16.0	4.9		19.69	5.20		17.0	4.7		19.06	5.03		16.5	4.8	
E4: Activity	20.21	4.37		16.3	4.7		20.10	4.35		15.4	4.8		20.20	4.37		15.8	4.7	
E5: Excitement-Seeking	20.69	3.67		17.3	4.3		21.78	3.54		17.8	4.4		20.76	3.67		17.6	4.4	
E6: Positive Emotions	23.19	3.66		17.2	4.7		22.69	3.86		15.7	5.1		23.15	3.68		16.4	4.9	
	21.46	4.36		19.5	4.3		23.99	4.18		20.8	4.5		21.64	4.39		20.2	4.5	
Openness to Experience																		
O1: Fantasy	112.94	18.10		110.1	17.5		123.58	17.04		111.0	17.2		113.70	18.23		110.6	17.3	
O2: Aesthetics	18.23	4.97		17.0	4.7		19.12	5.00		16.2	5.0		18.30	4.98		16.6	4.9	
O3: Feelings	16.14	5.68		16.7	5.4		19.58	5.46		18.5	5.1		16.39	5.73		17.6	5.3	
O4: Actions	20.66	4.23		19.7	3.8		22.77	3.87		20.8	4.1		20.81	4.24		20.3	4.0	
O5: Ideas	16.77	3.97		16.1	3.8		18.55	3.76		16.8	3.6		16.89	3.98		16.4	3.7	
O6: Values	21.94	5.22		19.8	5.0		21.98	4.80		18.2	5.0		21.94	5.19		19.0	5.0	
	19.20	4.49		20.8	4.5		21.57	3.99		20.5	3.8		19.37	4.49		20.7	4.1	

Table 2. Descriptive Statistics for All Domains and Facets of the NEO PI-R in the Pilot and Normative Sample^a (continued)

Domains/Facets	Male				Female				Combined			
	Pilots		Norm		Pilots		Norm		Pilots		Norm	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Agreeableness	114.78	16.61	120.1	16.1	121.25	15.90	128.5	14.4	115.23	16.64	124.3	15.8
A1: Trust	20.39	4.42	20.9	4.3	21.49	4.59	21.7	4.0	20.47	4.44	21.3	4.2
A2: Straightforwardness	19.10	4.41	20.3	4.3	20.69	4.32	22.2	4.3	19.21	4.42	21.2	4.4
A3: Altruism	23.72	3.54	22.8	3.6	24.73	3.43	24.3	3.2	23.78	3.54	23.6	3.5
A4: Compliance	16.18	4.17	18.1	3.7	16.68	4.29	19.6	4.1	16.21	4.18	18.9	4.0
A5: Modesty	16.84	4.69	18.1	4.4	18.33	4.45	19.7	3.8	16.95	4.68	18.9	4.2
A6: Tender-Mindedness	18.55	3.72	19.9	3.8	19.31	3.34	21.0	3.1	18.60	3.70	20.5	3.5
Conscientiousness	131.40	17.55	123.6	17.4	129.86	18.65	122.7	17.8	131.26	17.65	123.1	17.6
C1: Competence	24.48	3.28	22.5	3.5	23.75	3.40	21.8	3.5	24.42	3.30	22.2	3.5
C2: Order	19.08	4.30	18.9	4.1	19.25	4.66	19.1	4.2	19.09	4.33	19.0	4.2
C3: Dutifulness	24.19	3.56	23.2	3.9	23.51	3.79	23.2	3.8	24.14	3.58	23.2	3.9
C4: Achievement Striving	23.07	3.85	19.3	4.1	23.33	3.94	19.6	3.9	23.08	3.86	19.5	4.0
C5: Self-Discipline	22.69	4.13	21.8	4.2	22.49	4.44	21.7	4.4	22.67	4.15	21.8	4.3
C6: Deliberation	17.89	4.17	17.8	4.0	17.54	4.19	17.3	4.3	17.87	4.17	17.5	4.1

^aN = 12,072 (males = 11,725, females = 900) for the pilot sample and N = 1,000 (males = 500, females = 500) for the normative sample.

**Table 3. Effect Size Categories
for Cohen's *d* and
Pearson's *r***

Size	<i>d</i> ^a	<i>r</i>
Small	.10-.49	.05-.23
Medium	.50-.79	.24-.36
Large	≥.80	≥.37

^aFor computing Cohen's *d*,
the sign of the
correlation is ignored.

**Table 4. Correlations of the NEO PI-R
Domains in the Pilot and
Normative Sample^a**

Domain	N	E	O	A	C
N	1.00	-.21	.02	-.25	-.53
E	-.09	1.00	.40	.04	.27
O	.03	.01	1.00	-.02	-.02
A	.02	.02	.16	1.00	.24
C	.05	-.11	-.05	-.10	1.00

^aCorrelations below the diagonal are for
the pilot sample, and correlations
above the diagonal are for the
normative sample.

**Table 5. Absolute Difference of Correlations
Between the Pilot and Normative Sample**

Domain	N	E	O	A	C
N	1.00	S	S	M	L
E	.12	1.00	L	S	L
O	.01	.39	1.00	S	S
A	.27	.02	.18	1.00	M
C	.58	.38	.03	.34	1.00

Table 6. Correlations of All NEO PI-R Facets (N=12,702)

	N1	N2	N3	N4	N5	N6	E1	E2	E3	E4	E5	E6	O1	O2	O3	O4	O5	O6	A1	A2	A3	A4	A5	A6	C1	C2	C3	C4	C5	C6
N1	1																													
N2	.417	1																												
N3	.588	.437	1																											
N4	.554	.341	.612	1																										
N5	.344	.414	.385	.304	1																									
N6	.549	.336	.590	.516	.325	1																								
E1	-.130	-.301	-.215	-.202	-.018	-.198	1																							
E2	-.094	-.133	-.201	-.210	.048	-.116	.560	1																						
E3	-.291	-.015	-.365	-.420	-.081	-.472	.315	.360	1																					
E4	-.140	.020	-.241	-.256	-.041	-.359	.263	.246	.532	1																				
E5	-.103	.032	-.128	-.168	.190	-.208	.289	.414	.279	.298	1																			
E6	-.109	-.213	-.198	-.157	.092	-.182	.597	.386	.261	.318	.296	1																		
O1	.120	.062	.155	.099	.260	.087	.168	.076	-.037	-.023	.183	.280	1																	
O2	.067	-.049	.121	.061	.060	.059	.228	.079	-.004	.041	.076	.293	.381	1																
O3	.186	.146	.145	.100	.248	.029	.354	.214	.155	.195	.220	.431	.402	.461	1															
O4	-.210	-.222	-.194	-.232	-.066	-.181	.214	.187	.164	.187	.159	.249	.170	.281	.143	1														
O5	-.133	-.120	-.090	-.107	-.084	-.223	.166	.027	.188	.163	.133	.189	.290	.457	.264	.300	1													
O6	-.023	-.118	-.107	-.082	.017	-.063	.128	.138	.008	.022	.181	.132	.151	.213	.142	.281	.189	1												
A1	-.204	-.419	-.248	-.174	-.136	-.158	.450	.264	.104	.091	.074	.358	.018	.110	.097	.160	.102	.135	1											
A2	-.048	-.311	-.080	.017	-.255	.000	.151	-.036	-.154	-.080	-.223	.058	-.126	.002	-.045	.007	-.025	-.059	.303	1										
A3	-.110	-.401	-.185	-.103	-.167	-.208	.576	.222	.077	.134	.105	.396	.069	.165	.228	.164	.126	.084	.411	.364	1									
A4	-.029	-.522	-.051	.067	-.253	.066	.208	.015	-.278	-.201	-.219	.133	-.027	.122	-.069	.081	.017	.071	.327	.430	.389	1								
A5	.086	-.182	.175	.145	-.114	.143	.065	-.119	-.299	-.196	-.227	-.043	-.059	.085	-.013	.014	-.053	.000	.119	.384	.277	.354	1							
A6	.034	-.234	.026	.073	-.058	.043	.315	.132	-.075	-.038	-.002	.233	.083	.247	.212	.118	.072	.120	.289	.271	.430	.381	.315	1						
C1	-.321	-.224	-.469	-.368	-.336	-.600	.202	.108	.436	.386	.139	.155	-.157	-.061	.027	.074	.214	-.002	.139	.063	.250	-.035	-.161	-.005	1					
C2	-.017	-.037	-.143	-.076	-.234	-.180	-.001	-.050	.159	.217	-.056	-.005	-.223	-.037	-.041	-.092	.012	-.061	.004	.061	.071	.027	-.031	-.027	.373	1				
C3	-.245	-.249	-.351	-.261	-.394	-.456	.161	.014	.269	.325	.035	.082	-.200	-.055	-.023	.028	.144	-.054	.143	.250	.311	.091	.045	.052	.583	.407	1			
C4	-.146	-.072	-.309	-.242	-.246	-.430	.144	.100	.450	.552	.144	.122	-.197	-.032	.061	.083	.158	-.005	.083	.061	.137	-.118	-.128	-.034	.581	.442	.556	1		
C5	-.284	-.254	-.459	-.372	-.438	-.519	.156	.094	.370	.394	.091	.099	-.259	-.086	-.061	.101	.100	.034	.160	.136	.223	.040	-.056	.025	.625	.494	.629	.650	1	
C6	-.103	-.241	-.199	-.076	-.502	-.198	-.011	-.109	.029	.021	-.255	-.110	-.271	-.052	-.154	-.116	.058	-.086	.049	.255	.174	.255	.114	.078	.405	.404	.441	.320	.406	1

Table 7. Factor Structure of the NEO PI-R (N=12,702)

Facet	N	E	O	A	C
Anxiety	.800	-.041	-.035	-.003	-.092
Angry Hostility	.590	-.052	-.081	-.568	-.048
Depression	.767	-.168	.031	-.022	-.276
Self-Consciousness	.739	-.187	-.026	.107	-.179
Impulsiveness	.465	.294	.037	-.326	-.400
Vulnerability	.623	-.162	-.106	.097	-.463
Warmth	-.099	.747	.164	.355	.093
Gregariousness	-.142	.736	-.023	.028	-.036
Assertiveness	-.293	.474	.054	-.343	.419
Activity	-.071	.457	.091	-.257	.519
Excitement-Seeking	-.102	.585	.143	-.295	.003
Positive Emotions	-.051	.676	.306	.188	.058
Fantasy	.167	.181	.603	-.068	-.261
Aesthetics	.175	.069	.771	.151	-.004
Feelings	.375	.440	.523	.002	.080
Actions	-.333	.151	.523	.046	-.047
Ideas	-.117	-.036	.751	-.027	.207
Values	-.165	.083	.435	.037	-.108
Trust	-.254	.404	.050	.496	.013
Straightforwardness	-.018	-.045	-.111	.677	.142
Altruism	-.062	.418	.129	.623	.216
Compliance	-.091	-.072	.048	.784	-.059
Modesty	.158	-.154	-.003	.614	-.062
Tender-Mindedness	.120	.224	.185	.592	-.004
Competence	-.331	.140	.040	-.028	.728
Order	.091	-.086	-.103	.038	.685
Dutifulness	-.197	.026	-.028	.184	.751
Achievement Striving	-.089	.175	.004	-.111	.804
Self-Discipline	-.311	.081	-.053	.065	.771
Deliberation	-.086	-.314	-.092	.339	.593

5.0 DISCUSSION

The purpose of this study was to compare scores on the NEO PI-R from a large USAF pilot sample to the nationally representative normative population. Specifically, this study examined differences in descriptive statistics, correlations, and factor structures between the pilot sample and normative population, including male versus female comparisons.

The results suggested differences between these two data sources that support the use of both sets of data for clinical evaluation. Descriptive statistics indicated that there were substantial mean differences between the pilot sample and the normative data for four of the five domain scores (*Neuroticism*, *Extraversion*, *Agreeableness*, and *Conscientiousness*). This result

lends evidence that Air Force pilots are a highly selected group whose scores are quite different than the general population, suggesting that clinical evaluations might be quite different if only the normative population was used as a comparison group. This outcome supports King's (Ref 28) caution that highly selected and trained aviators should be compared to other aviators rather than the general population.

More specifically, for the combined sample, there were differences at the domain level but minor differences for most of the facet scores. Pilots scored lower on *Neuroticism* and *Agreeableness* and higher on *Extraversion*, *Openness to Experience*, and *Conscientiousness*. Some of the pilot norm group comparisons were more dramatic for men than women. For example, female pilots scored much higher on *Extraversion* and *Openness to Experience* than women in the normative sample. Differences in facet scores for the combined pilots versus the combined national normative sample also illustrate the need for using pilot-specific norms. This recommendation is consistent with Chappelle et al. (Ref 27), who identified personality traits that distinguished female pilots from male pilots and from nonpilot women in the nationally representative normative sample. Overall, the standard deviations were not substantially different for the two groups.

The low correlations among domain scores for the pilot sample, as well as the differences between the pilot correlations and the national normative correlations, should have little impact on the clinical interpretation of scores. This result, however, further illustrates the uniqueness of the highly selected pilot samples and reinforces the need for pilot-specific normative data.

The results of the factor analysis for the pilot sample confirmed the structure found in the nationally representative normative sample. This result demonstrates further evidence of equivalence of construct measurement for both samples, lending additional support for the use of pilot scores as a standard for clinical evaluation.

In summary, these results highlight the distinction in personality between the pilot-specific samples and the national normative population. The measurement similarity shows the applicability of personality measures for the pilot sample, while the mean differences reflect dramatic disparities in personality scores for the highly selected and trained pilots. Just as driving a car at 110 miles per hour on city streets would be considered very fast, 110 miles per hour would be quite slow on a professional racetrack. As racecar drivers are a class above the average driver on the street, the personality of Air Force pilots is a class above the general population. Therefore, pilot-specific normative data should be considered when clinically assessing a pilot, in conjunction with the population norms.

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APPENDIX A

Additional Descriptive Analyses (Including Skewness And Kurtosis)

**Table A-1. Male Descriptive Statistics for All Domains
of the NEO PI-R (N=11,725)**

Domain	Mean	Median	Mode	SD	Skewness	Kurtosis	Minimum	Maximum
N	67.88	67.00	66	18.39	.22	.20	6	160
E	127.68	128.00	129	17.15	-.16	.22	55	187
O	112.94	113.00	110	18.10	.05	.23	40	183
A	114.78	116.00	117	16.61	-.34	.65	36	176
C	131.40	132.00	132	17.55	-.26	.39	39	182

**Table A-2. Female Descriptive Statistics for All Domains
of the NEO PI-R (N=900)**

Domain	Mean	Median	Mode	SD	Skewness	Kurtosis	Minimum	Maximum
N	74.01	72.00	65	20.81	.29	.12	15	142
E	132.69	133.00	133	17.19	-.17	-.12	82	183
O	123.58	124.00	127	17.04	-.06	.31	54	173
A	121.25	122.00	118	15.90	-.32	.49	54	167
C	129.86	131.00	140	18.65	-.43	.54	50	181

**Table A-3. Combined Descriptive Statistics for All Domains
of the NEO PI-R (N=12,702)**

Domain	Mean	Median	Mode	SD	Skewness	Kurtosis	Minimum	Maximum
N	68.34	67.00	66	18.65	.24	.23	6	160
E	128.01	129.00	129	17.20	-.16	.19	55	187
O	113.70	113.00	110	18.23	.04	.21	40	183
A	115.23	116.00	117	16.64	-.33	.63	36	176
C	131.26	132.00	132	17.65	-.28	.41	39	182

**Table A-4. Descriptive Statistics for All Facets of the
NEO PI-R in the Male Sample (N=11,725)**

Facet	Mean	Median	Mode	SD	Skewness	Kurtosis	Minimum	Maximum
n1raw	12.19	12.00	12	4.51	.11	-.14	0	32
n2raw	11.78	11.00	10	4.44	.47	.38	0	32
n3raw	9.97	10.00	10	4.30	.54	.59	0	31
n4raw	12.58	12.00	12	4.25	.29	.07	0	29
n5raw	14.69	15.00	14	4.44	.12	-.21	0	32
n6raw	6.66	7.00	8	3.25	.19	.14	0	26
e1raw	23.11	23.00	24	3.88	-.50	.72	3	32
e2raw	19.01	20.00	20	5.01	-.42	.27	0	32
e3raw	20.21	20.00	20	4.37	-.14	.04	1	32
e4raw	20.69	21.00	20	3.67	-.08	.12	7	32
e5raw	23.19	23.00	23	3.66	-.27	.15	8	32
e6raw	21.46	22.00	22	4.36	-.30	.19	4	32
o1raw	18.23	18.00	18	4.97	.00	-.26	1	32
o2raw	16.14	16.00	16	5.68	-.01	-.30	0	32
o3raw	20.66	21.00	21	4.23	-.24	.17	1	32
o4raw	16.77	17.00	16	3.97	-.04	-.08	3	32
o5raw	21.94	22.00	24	5.22	-.34	-.05	2	32
o6raw	19.20	20.00	20	4.49	-.44	.43	0	32
a1raw	20.39	21.00	24	4.42	-.72	.84	1	32
a2raw	19.10	19.00	20	4.41	-.19	-.07	2	32
a3raw	23.72	24.00	24	3.54	-.31	.43	5	32
a4raw	16.18	16.00	16	4.17	-.22	.04	0	32
a5raw	16.84	17.00	18	4.69	-.15	.04	0	32
a6raw	18.55	19.00	20	3.72	-.34	.64	2	31
c1raw	24.48	24.00	24	3.28	-.23	.32	10	32
c2raw	19.08	19.00	20	4.30	-.31	.41	1	32
c3raw	24.19	24.00	24	3.56	-.26	.13	8	32
c4raw	23.07	23.00	23	3.85	-.47	.44	3	32
c5raw	22.69	23.00	24	4.13	-.50	.60	2	32
c6raw	17.89	18.00	18	4.17	-.17	.03	1	32

**Table A-5. Descriptive Statistics for All Facets of the
NEO PI-R in the Female Sample (N=900)**

Facet	Mean	Median	Mode	SD	Skewness	Kurtosis	Minimum	Maximum
n1raw	14.06	14.00	14	4.85	.13	-.18	0	31
n2raw	11.93	11.00	10	4.63	.64	.70	0	31
n3raw	10.86	10.00	8	4.99	.61	.40	0	28
n4raw	13.38	13.00	10	4.65	.37	-.09	1	28
n5raw	15.78	16.00	16	4.84	.07	-.10	0	32
n6raw	7.99	8.00	7	3.43	.18	.22	0	20
e1raw	24.44	25.00	24	3.96	-.70	.85	9	32
e2raw	19.69	20.00	22	5.20	-.35	-.02	2	32
e3raw	20.10	20.00	22	4.35	-.19	-.08	6	32
e4raw	21.78	22.00	22	3.54	-.20	.30	10	32
e5raw	22.69	23.00	24	3.86	-.31	-.10	10	32
e6raw	23.99	24.00	24	4.18	-.44	.13	11	32
o1raw	19.12	19.00	18	5.00	-.18	-.28	4	32
o2raw	19.58	20.00	22	5.46	-.31	-.07	1	32
o3raw	22.77	23.00	22	3.87	-.20	.21	8	32
o4raw	18.55	19.00	19	3.76	-.23	-.07	6	28
o5raw	21.98	22.00	24	4.80	-.29	.04	6	32
o6raw	21.57	22.00	22	3.99	-.49	.75	7	32
a1raw	21.49	22.00	24	4.59	-.90	1.43	2	32
a2raw	20.69	21.00	21	4.32	-.30	.20	5	31
a3raw	24.73	25.00	24	3.43	-.34	.39	11	32
a4raw	16.68	17.00	15	4.29	-.24	.24	2	32
a5raw	18.33	18.00	16	4.45	-.17	.05	2	31
a6raw	19.31	19.00	20	3.34	-.18	.32	7	30
c1raw	23.75	24.00	25	3.40	-.32	.55	9	32
c2raw	19.25	19.00	18	4.66	-.44	.30	0	30
c3raw	23.51	24.00	24	3.79	-.29	.07	9	32
c4raw	23.33	24.00	22	3.94	-.51	.20	10	32
c5raw	22.49	23.00	24	4.44	-.68	.73	5	32
c6raw	17.54	18.00	20	4.19	-.22	.30	0	29

**Table A-6. Descriptive Statistics for All Facets of the
NEO PI-R in the Combined Sample (N=12,702)**

Facet	Mean	Median	Mode	SD	Skewness	Kurtosis	Minimum	Maximum
n1raw	12.33	12.00	12	4.56	.13	-.12	0	32
n2raw	11.80	11.00	10	4.46	.48	.40	0	32
n3raw	10.04	10.00	10	4.36	.56	.62	0	31
n4raw	12.64	12.00	12	4.28	.31	.07	0	29
n5raw	14.78	15.00	14	4.47	.12	-.19	0	32
n6raw	6.76	7.00	8	3.28	.20	.16	0	26
e1raw	23.20	24.00	24	3.90	-.51	.70	3	32
e2raw	19.06	20.00	20	5.03	-.41	.25	0	32
e3raw	20.20	20.00	20	4.37	-.14	.03	1	32
e4raw	20.76	21.00	20	3.67	-.09	.13	7	32
e5raw	23.15	23.00	23	3.68	-.28	.13	8	32
e6raw	21.64	22.00	22	4.39	-.30	.16	4	32
o1raw	18.30	18.00	18	4.98	-.01	-.27	1	32
o2raw	16.39	16.00	16	5.73	-.03	-.31	0	32
o3raw	20.81	21.00	22	4.24	-.24	.17	1	32
o4raw	16.89	17.00	16	3.98	-.05	-.10	3	32
o5raw	21.94	22.00	24	5.19	-.34	-.04	2	32
o6raw	19.37	20.00	20	4.49	-.44	.43	0	32
a1raw	20.47	21.00	24	4.44	-.72	.86	1	32
a2raw	19.21	20.00	20	4.42	-.19	-.06	2	32
a3raw	23.78	24.00	24	3.54	-.31	.43	5	32
a4raw	16.21	16.00	16	4.18	-.22	.06	0	32
a5raw	16.95	17.00	18	4.68	-.15	.04	0	32
a6raw	18.60	19.00	20	3.70	-.34	.64	2	31
c1raw	24.42	24.00	24	3.30	-.24	.34	9	32
c2raw	19.09	19.00	20	4.33	-.32	.40	0	32
c3raw	24.14	24.00	24	3.58	-.26	.13	8	32
c4raw	23.08	23.00	23	3.86	-.47	.41	3	32
c5raw	22.67	23.00	24	4.15	-.51	.61	2	32
c6raw	17.87	18.00	18	4.17	-.17	.05	0	32

APPENDIX B

Specific Tables for the Domains and Facets Converting Raw Score to Percentiles for Pilot Candidates

Table B-1. Percentiles for NEO PI-R Domain Scales

Raw Score	Males					Females					Combined				
	N	E	O	A	C	N	E	O	A	C	N	E	O	A	C
22	1										1				
25	1					1					1				
28	1					1					1				
31	2					1					2				
34	3					2					3				
37	4					3					4				
40	6					4					6				
43	9					6					8				
46	1					8					1				
	1										1				
49	1					1					1				
	5					1					5				
52	2					1					1				
	0					5					9				
55	2					1					2				
	5					9					4				
58	3					2					3				
	1					3					0				
61	3					2					3				
	8					8					7				
64	4		1	1		3			1		4		1	1	
	4					3					4				
67	5		1	1		4			1		5		1	1	
	1					0					1				
70	5		1	1		4			1		5		1	1	
	8					6					7				
73	6		2	1		5			1		6		1	1	
	4					1					3				
76	7		2	2		5		1	2		6		2	2	
	0					7					9				
79	7	1	3	3	1	6		1	3	1	7		3	3	1
	5					2					4				
82	8	1	4	4	1	6		1	4	1	7	1	4	4	1
	0					7					9				
85	8	1	6	5	1	7		1	5	1	8	1	6	5	1
	3					2					2				
88	8	2	8	6	1	7		2	6	1	8	2	8	6	1
	7					7					6				
91	9	2	1	8	2	8	1	3	8	2	8	2	1	8	2
	0		2			2					9		1		
94	9	3	1	1	3	8	1	4	1	3	9	3	1	1	3
	2		5	1		4			1		2		4	0	
97	9	5	1	1	3	8	3	7	1	3	9	4	1	1	4
	4		9	4		7			4		4		8	3	

Table B-1. Percentiles for NEO PI-R Domain Scales (continued)

Raw Score	Males					Females					Combined				
	N	E	O	A	C	N	E	O	A	C	N	E	O	A	C
100	9	6	2	1	4	9	4	8	1	4	9	6	2	1	5
	6		4	8		0			8		5		3	7	
103	9	8	3	2	6	9	6	1	2	6	9	8	2	2	6
	7		0	3		1		1	3		6		8	2	
106	9	1	3	2	8	9	9	1	2	8	9	1	3	2	8
	8	1	6	8		3		5	8		7	1	4	7	
109	9	1	4	3	1	9	1	2	3	1	9	1	4	3	1
	8	4	3	4	0	4	0	0	4	0	8	4	1	4	1
112	9	1	5	4	1	9	1	2	4	1	9	1	4	4	1
	9	8	0	2	3	6	3	5	2	3	9	8	8	1	4
115	9	2	5	4	1	9	1	3	4	1	9	2	5	4	1
	9	2	6	9	7	7	6	1	9	7	9	2	5	8	7
118	9	2	6	5	2	9	2	3	5	2	9	2	6	5	2
	9	8	3	7	2	7	0	6	7	2	9	7	1	6	2
121		3	6	6	2	9	2	4	6	2		3	6	6	2
		4	9	5	7	8	3	5	5	7		4	7	4	7
124		4	7	7	3	9	3	5	7	3		4	7	7	3
		1	5	3	3	9	0	2	3	3		0	3	2	3
127		4	8	7	3	9	3	6	7	3		4	7	7	3
		8	0	9	9	9	6	0	9	9		8	8	8	9
130		5	8	8	4	9	4	6	8	4		5	8	8	4
		6	4	4	7	9	3	8	4	7		5	3	4	7
133		6	8	8	5	9	5	7	8	5		6	8	8	5
		3	8	6	4	9	1	4	9	4		3	7	8	4
136		7	9	9	6		5	7	9	6		7	9	9	6
		0	1	2	2		8	8	2	2		0	0	1	2
139		7	9	9	6		6	8	9	6		7	9	9	6
		6	3	4	8		5	3	4	8		6	2	4	8
142		8	9	9	7		7	8	9	7		8	9	9	7
		1	5	6	4		2	7	6	4		1	4	6	4
145		8	9	9	8		7	9	9	8		8	9	9	8
		6	6	7	0		8	1	7	0		5	6	7	0
148		8	9	9	8		8	9	9	8		8	9	9	8
		9	7	8	4		3	3	8	4		9	7	8	4
151		9	9	9	8		8	9	9	8		9	9	9	8
		2	8	9	8		7	5	9	8		2	8	9	8
154		9	9	9	9		9	9	9	9		9	9	9	9
		4	9		1		0	6		1		4	9		1
157		9	9		9		9	9		9		9	9		9
		6	9		3		2	7		3		6	9		3
160		9	9		9		9	9		9		9	9		9
		7	9		5		5	8		5		7	9		5
163		9			9		9	9		9		9			9
		9			7		7	9		7		8			7
166		9			9		9	9		9		9			9
		9			8		8	9		8		9			8
169		9			9		9			9		9			9
		9			9		9			9		9			9
172							9								

Table B-2. Percentiles for Neuroticism Facet Scales

Raw Score	Males						Females						Combined					
	N1	N2	N3	N4	N5	N6	N1	N2	N3	N4	N5	N6	N1	N2	N3	N4	N5	N6
0						2						1						2
1	1		1			6		1	2			3	1		1			6
2	1	1	3	1		12		1	3			5	1	1	3	1		11
3	2	2	5	1		18	1	2	5	1		10	2	2	5	1		18
4	4	4	9	2	1	26	2	3	8	2	1	15	4	4	9	2	1	25
5	6	6	14	4	1	35	3	6	12	3	1	21	6	6	14	4	1	34
6	10	10	20	6	2	47	4	9	17	5	2	32	10	10	20	6	2	45
7	14	15	28	10	5	59	8	15	24	8	4	45	14	15	28	10	4	58
8	21	23	38	16	8	73	13	23	34	14	7	58	21	23	38	16	8	71
9	28	32	48	24	12	82	18	31	43	20	10	67	28	32	48	24	12	81
10	37	42	59	33	18	89	25	42	53	30	14	78	36	42	59	33	18	89
11	45	51	68	43	25	94	32	52	59	38	19	86	44	51	67	42	25	93
12	54	61	76	52	33	95	39	61	68	47	25	91	53	61	75	52	32	96
13	62	68	82	61	41	98	47	68	74	54	33	94	61	68	81	61	40	98
14	70	75	86	69	50	99	54	74	79	61	41	97	69	75	86	69	49	99
15	76	81	90	76	58	99	62	80	84	68	48	98	75	81	89	76	57	99
16	82	86	92	82	66		70	85	87	76	57	98	81	86	92	82	65	
17	87	89	94	87	73		75	88	89	82	63	99	86	89	94	87	72	
18	92	92	96	91	80		81	92	92	86	70		91	92	96	91	79	
19	94	95	97	94	85		86	93	94	89	77		94	94	97	93	85	
20	97	96	98	96	90		89	95	95	93	83		96	96	98	96	90	
21	98	97	99	98	93		94	96	96	94	88		98	97	99	97	93	
22	99	98	99	99	96		97	97	97	96	92		99	98	99	98	96	
23	99	99		99	98		98	98	98	97	94		99	99		99	97	
24		99			99		99	99	99	99	97			99		99	99	
25					99		99	99		99	98						99	
26							99				99							
27											99							
28											99							
29																		
30																		
31																		
32																		

Table B-3. Percentiles for Extraversion Facet Scales

Raw Score	Males						Females						Combined					
	E1	E2	E3	E4	E5	E6	E1	E2	E3	E4	E5	E6	E1	E2	E3	E4	E5	E6
0																		
1																		
2																		
3																		
4		1											1					
5		1					1						1					
6		1					1						1					
7		2					2						2					
8		3	1				2						3	1				
9		5	1				4	1					4	1				1
10	1	6	2	1			5	2					6	2		1		1
11	1	8	3	1			7	3				1	1	8	3	1		2
12	1	11	4	2			1	9	5	1		1	1	11	4	2		3
13	2	14	6	3	1		1	13	7	2	1	1	2	14	7	3	1	4
14	3	18	10	5	2		2	16	10	3	3	3	3	18	10	5	2	6
15	4	22	14	8	2		3	20	15	5	4	4	4	22	14	7	3	9
16	6	28	19	12	4		4	26	21	7	7	5	6	28	20	12	4	12
17	8	34	26	19	6		6	32	28	11	11	8	8	34	26	18	7	17
18	12	42	34	27	10		8	38	35	16	15	11	11	41	34	26	10	23
19	16	50	42	36	15		11	46	42	23	20	14	16	50	42	35	15	29
20	22	59	52	48	22		14	54	51	34	27	18	21	59	52	47	23	37
21	29	68	61	59	31		19	60	60	45	35	24	29	67	61	58	31	46
22	39	76	70	69	41		25	69	70	58	44	32	38	76	70	69	41	56
23	51	83	78	78	52		35	76	78	69	56	42	50	82	78	78	52	66
24	64	88	84	85	63		49	83	85	79	67	55	63	88	84	85	64	75
25	74	92	89	91	73		59	87	90	86	76	64	73	92	89	90	74	82
26	83	95	92	94	82		70	91	95	92	84	71	82	95	93	94	82	87
27	88	97	95	97	88		78	94	96	95	90	80	88	97	95	97	88	92
28	92	98	97	98	93		84	97	98	97	95	87	92	98	97	98	93	95
29	96	99	99	99	97		91	98	99	98	97	90	95	99	99	99	96	97
30	98	99	99		99		95	99			99	95	98	99	99		99	98
31	99						99					98	99					99
32																		

Table B-4. Percentiles for Openness Facet Scales

Raw Score	Males						Females						Combined					
	01	02	03	04	05	06	01	02	03	04	05	06	01	02	03	04	05	06
0																		
1																		
2		1												1				
3		1												1				
4		2						1						2				
5		3						1						3				
6	1	4		1		1		1					1	4		1		1
7	1	6		1	1	1	1	2					1	6		1	1	1
8	2	9	1	2	1	2	2	3		1	1		2	9		2	1	2
9	4	13	1	3	1	3	3	3		1	1	1	4	12	1	3	1	3
10	6	17	1	6	2	4	5	6		2	1	1	6	16	1	5	2	4
11	9	21	2	9	3	6	8	8		4	2	2	9	20	2	9	3	5
12	13	27	3	14	5	8	10	11	1	7	4	3	13	26	3	14	5	8
13	18	33	5	20	6	11	14	15	2	10	5	4	17	32	5	20	6	10
14	23	39	8	29	9	14	18	19	2	14	7	5	23	38	7	28	8	14
15	30	46	11	37	11	19	24	23	4	19	9	7	29	44	11	36	11	18
16	37	53	16	47	15	25	30	28	4	28	12	10	37	51	15	46	15	24
17	45	59	22	57	20	32	37	33	8	38	16	15	44	57	21	56	19	31
18	53	65	29	66	25	40	45	40	14	48	22	19	52	64	28	65	25	38
19	60	71	38	75	30	49	52	47	19	59	29	25	59	70	36	74	30	47
20	67	77	47	82	37	59	59	53	26	70	36	35	66	75	45	82	37	58
21	73	82	56	88	43	69	66	60	34	77	43	46	73	80	55	88	43	67
22	80	86	66	93	51	78	73	69	47	85	53	59	79	85	64	92	52	76
23	85	90	75	96	60	85	79	76	58	91	61	69	85	89	74	95	60	83
24	90	93	83	98	69	90	86	82	68	95	71	78	89	92	82	98	69	89
25	93	95	88	99	75	94	91	86	77	97	77	86	93	94	88	99	75	93
26	95	97	92		81	96	94	91	83	99	83	91	95	96	92	99	81	96
27	97	98	95		85	98	96	94	89		88	95	97	98	95		85	98
28	98	99	97		89	99	98	96	92		91	97	98	99	97		89	99
29	99	99	99		93		99	98	96		94	98	99	99	98		93	99
30			99		95		99	99	98		96	99			99		95	
31					98			99			98						98	
32																		

Table B-5. Percentiles for Agreeableness Facet Scales

Raw Score	Males						Females						Combined					
	A1	A2	A3	A4	A5	A6	A1	A2	A3	A4	A5	A6	A1	A2	A3	A4	A5	A6
0																		
1																		
2																		
3																		
4					1					1							1	
5				1	1		1			1						1	1	
6	1			1	2		1			2	1		1			1	2	
7	1	1		2	3	1	1	1		3	1		1	1		2	3	1
8	1	1		4	4	1	2	1		4	2		1	1		4	4	1
9	2	2		6	6	2	2	1		5	2	1	2	2		6	6	2
10	3	3		9	9	2	3	1		7	5	1	3	3		9	9	2
11	5	5		13	13	4	4	2		10	7	1	4	5		13	12	4
12	6	8		19	18	6	5	3		16	9	3	6	7		19	17	6
13	8	11	1	25	23	9	6	5		23	13	4	8	11	1	25	22	8
14	10	16	1	33	30	13	8	9		29	19	8	10	15	1	33	29	13
15	13	21	2	42	38	19	9	13	1	38	25	13	13	20	2	41	37	19
16	17	27	3	51	46	27	13	17	2	48	35	19	17	27	3	51	45	26
17	22	34	4	61	54	37	17	22	3	56	42	28	22	34	4	61	54	36
18	29	42	7	70	63	47	21	29	4	66	51	38	28	41	7	70	62	47
19	36	51	11	78	71	59	27	36	6	74	60	51	35	50	11	78	70	58
20	44	60	17	86	78	70	34	45	10	81	69	64	43	59	17	85	77	70
21	53	70	25	91	84	79	41	56	15	87	75	75	52	69	24	91	84	79
22	64	78	34	95	90	87	52	65	24	92	82	84	63	77	34	94	89	87
23	75	85	45	97	93	92	64	74	33	95	88	90	74	84	45	97	93	92
24	88	90	59	98	95	96	78	82	48	97	93	95	87	90	58	98	95	96
25	93	94	70	99	97	98	85	88	59	99	95	98	92	93	69	99	97	98
26	95	96	79		98	99	91	92	69	99	97	99	95	96	78		98	99
27	97	98	86		99	99	94	95	79		98	99	97	97	86		99	99
28	98	99	91				96	97	86		99		98	99	91			
29	99	99	95				98	98	92				99	99	95			
30	99		98				99	99	96				99		98			
31			99				99		98						99			
32																		

Table B-6. Percentiles for Conscientiousness Facet Scales

Raw Score	Males						Females						Combined					
	C1	C2	C3	C4	C5	C6	C1	C2	C3	C4	C5	C6	C1	C2	C3	C4	C5	C6
0																		
1																		
2																		
3																		
4																		
5																		
6		1				1	1				1		1					1
7		1				1	1				1		1					1
8		1				2	2			1	2		1					2
9		2				3	3			1	3		2					3
10		3			1	4	4			2	5		3				1	5
11		5		1	1	7	6		1	2	8		5			1	1	7
12		7		1	2	10	9		1	3	12		7			1	2	10
13		10		2	3	15	11	1	1	4	16		10			2	3	15
14		14	1	2	4	21	1	15	1	2	6	22		14	1	2	4	21
15	1	18	1	3	5	27	2	20	2	4	8	31	1	18	1	3	6	28
16	1	25	2	5	8	36	2	26	4	5	10	39	2	25	2	5	8	36
17	2	33	4	8	11	45	4	31	6	8	13	48	3	33	4	8	11	45
18	4	42	6	11	15	55	6	41	10	11	17	58	4	42	6	11	15	55
19	6	52	9	16	20	64	10	50	15	16	22	66	7	52	10	16	20	64
20	11	63	14	24	26	73	16	59	22	22	28	77	11	62	15	24	27	73
21	16	72	21	32	34	81	23	66	28	30	35	83	17	71	22	32	34	81
22	25	80	31	43	43	87	34	75	36	40	43	89	26	80	31	43	43	87
23	37	86	41	53	54	92	45	82	47	50	53	93	38	86	42	53	54	92
24	51	91	54	63	67	95	57	88	59	58	67	97	52	90	54	62	68	95
25	64	94	64	72	77	97	70	92	69	67	77	98	64	94	65	72	77	97
26	74	96	74	80	84	98	81	96	79	77	84	98	74	96	74	80	84	98
27	82	98	82	88	89	99	87	97	86	86	90	99	83	98	82	88	89	99
28	88	99	88	93	93		92	99	92	92	94		89	99	88	93	93	
29	93		93	97	96		96		95	97	96		94		93	97	96	
30	97		97	99	98		98		98	99	98		97		97	99	98	
31	99		99		99		99		99		99		99		99		99	
32																		

LIST OF ABBREVIATIONS AND ACRONYMS

MCM	Millon Clinical Multiaxial Inventory
NEO PI-R	Revised NEO Personality Inventory
SD	standard deviation
USAF	United States Air Force