Comparative Analysis of MMPI Profiles in Two Groups of AB-Initio Flying Trainees

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The study compared MMPI profiles of 36 Air Force cadets and 25 Army officers who were undergoing high-stress and low-stress ab-initio flying training respectively. Fourteen subjects (Group A) in high stress training, obtained T-scores of >70 in many of the MMPI scales. On the other hand the scores remained <70 in the remaining subjects (group N=22) in this as well as in almost all the subjects in low stress training group (C=25). The analysis showed that Group N and C had identical personality profiles, but Group A obtained very significantly higher scores in most of the MMPI scales. Paradoxically the performance scores of Group N and A were identical. Multiple regression analyses was carried out between MMPI scores and performance ratings. The study has shown that optimum personality profile for best success during flying training is the one which has balanced personality traits with slight elevation on Mania scale. Further the aberrant group (Group A) identified in the study showed gross abnormality in their personality profile even though their test performance did not show any deterioration at ab-initio stage. In addition, test scores on Navigational abilities seemed to discriminate the normal and aberrant groups in the high stress training. The implications of these findings have been discussed.

Keywords : Person-Environment Interactions, Minnesota Multiphasic Personality Inventory, Pilot Navigation Training.

The airborne environment is unique: exhilarating and at times dangerous. The dangers are over-shadowed by masterful fantasies of effortless and flawless flight in a neophyte flier. They are mitigated to some extent by the defensive mechanisms of denial, suppression, rationalization and intellectualization in more experienced fliers. Flying training is associated with intense inter-personal relationship between instructors and pupils (Tucker,1967)[1]. This relationship is known for its highly emotional content. It has been described in mythological story of Daedalus and Icarus as father and son. It has got connotation of transference and counter-transference reactions in psycho-therapeutic parlance. Armstrong(1939)[2] and Bauer(1926)[3] identified presence of nervous instability in early aviators. Burton et al (1977)[4] and Mckenzey et al (1967)[5] found signs of sympatho-adrenal responses in aircrew during high stress sorties. From the above, it is clear that flying training imposes excessive stress in learning the sophisticated skills of flying on the background of "emotional turmoil".

Jennings(1948)[6] applied MMPI for the purpose of distinguishing psychologically high-risk and low-risk combat flying personnel, and found promising trends for its use as a screening tool. Fulkerson (1958)[7] has studied MMPI profile of 643 aviators. He found pilots to have low score on Hypochondriasis (Hs), Psychasthenia (Pt), Schizophrenia (Sc) and Social Introversion (Si) scales. Reinhardt (1970)[8] considers MMPI to be a very sensitive inventory for studying P-E (Person - Environment) interactions in the stressful flying environment. However no studies of actual field conditions have been reported.

The present study aimed to find the relationship between the personality profile and performance of flying trainees. In this study two groups have been compared, one consisting of young and inexperienced trainees who underwent prolonged and severe stress during their training. The other group consisted of mature and experienced Army officers who were required to do elementary flying training under minimal stress.

Material and Methods

Subjects : 36 unmarried male Air Force cadets underwent flying training. They were in the age group of 20-25 years with mean age of 21.5 yrs. Their training involved high stress. Twenty five Army Artillery Corps officers also underwent flying training. They were in the age group of

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25-29 years with mean age of 26.1 years. Their training involved low stress. They had put in 3 to 6 years of commissioned service. Except for the age, years of service and marital status, there were no significant differences in the other socio-demographic characteristics of the subjects in the two training conditions.

Design : The study included two experimental conditions, high stress training and low stress training. High stress training involved intense and prolonged exposure to basic and advanced level of flying training on a Jet trainer aircraft for total of 170 hrs. This included general handling, instrument flying, navigation, close formation, aerobatics, range work etc. This was completed over a period of one year. On the other hand, low stress training was imparted for general handling of a propeller driven aircraft for total of 30 hrs over a period 6 months prior to assignment to helicopter training of the subjects for Air Observation Post (AOP) duties. There was an attrition of 20-30% for high stress training and only 5-10% for low stress training.

Table I MMPI Scores of Gp N (Normal) and Gp C (Control)

	Gp N (Normal)	Gp C (Control)	t Value	Significance
L	56.9	53.6	1.57	NS
F	54.9	53.0	0.95	NS
K	58.5	55.6	1.19	NS
Hs	51.0	49.0	0.94	NS
D	58.2	56.0	0.74	NS
Hy	48.9	50.3	0.58	NS
Pd	50.5	49.1	0.48	NS
Mf	57.7	58.5	0.36	NS
Pa	54.4	55.2	0.33	NS
Pt	51.8	52.4	0.19	NS
Sc	55.3	53.8	0.57	NS
Ma	58.0	59.4	0.57	NS
Si	45.7	47.6	0.84	NS

Table II MMPI Scores of Gp N (Normal) and Gp A (Aberrant)

	Gp N (Normal)	Gp A (Aberrant)	t Value	Significance
L	56.9	56.0	0.26	NS
F	54.9	73.5	4.01	p<0.001
K	58.5	56.3	0.60	NS
Hs	51.0	60.6	2.87	p<0.01
D	58.2	64.5	1.60	NS
Hy	48.9	57.6	2.75	p<0.01
Pd	50.5	61.3	3.63	p<0.001
Mf	57.7	66.1	2.89	p<0.01
Pa	54.4	71.1	4.90	p<0.001
Pt	51.8	70.0	6.22	p<0.001
Sc	55.3	78.5	5.12	p<0.001
Ma	58.0	68.4	3.00	p<0.01
Si	45.7	55.6	2.75	p<0.01

Measures : (MMPI and Performance Ratings) Minnesota Multiphasic Personality Inventory (MMPI) was used for studying personality profile of the trainees. This inventory provides personality profile in the form of standardized T scores on 3 validity scales and 10 clinical scales. The validity scales are known as Lie (L), Faking (F) and Caution (K) scales. The clinical scales are abbreviated as Hs (Hypochondriasis), D (Depression), Hy (Hysteria), Pd (Psychopathic deviate), Mf (Masculinity-femininity), Pa (Paranoid), Pt (Psychasthenia), Sc (Schizophrenia), Ma (Mania) and Si (Social Introversion). It is considered an objective technique of personality assessment due to its relatively unambiguous stimuli and structured response format. It provides a comprehensive picture of psychological functioning of an individual in relation to his symptoms, major needs, perceptions of the environment, reactions to stress, self concept, sexual identification, interpersonal relationships and psychological resources (Graham, 1987)[9].

Performance Ratings : During the course of training, the acquisition of flying skills by the subjects belonging to high stress condition was evaluated at various stages. These measures reflected careful assessment by independent examiners who had the responsibility for ensuring safety, and in doing so, had the authority for recommending suspension from flying training at the respective stages. At the end of the training, performance ratings were available under following headings for high stress training: Instrument Flying Training (IFT), Low Level Navigation Training (LLNT), Pilot Navigation Training (PNT), Close Formation Training (CFT), Night Flying Training (NFT), Aerobatics (Aeros), General Handling (GH), Range Scores (RANGE) and Overall scores. Due to limited flying in the second experimental condition of low stress training, scores of pass/fail nature were given and as such were not useful to this study.

Procedure : All trainees who graduated from two consecutive courses at a particular base, were taken up for this study. The subjects were requested to come out with their true feelings. They were assured of absolute confidentiality. The timing of administration of MMPI was chosen to be 3-4 weeks prior to their final graduation to ensure maximum stress effects as they were yet to clear 2-3 stage tests and hence could not be assured of successful completion at that time.

Results

Standardised scores (T) of various MMPI validity and clinical scales were calculated with the help of the manual. High stress subjects (36 Air Force Cadets) were divided in two groups : Normal (Gp N) and Aberrant (Gp A) based on T scores on MMPI scales. Gp N subjects (22 of 36) obtained T-scores of <70 in all the MMPI scales. Whereas Gp A subjects (14 of 36) obtained T score of >70 in one or more MMPI scales. On the other hand low stress subjects (25 Army officers) showed only marginal elevation of T scores >70 in 3 subjects. This group was designated as Group C (or Control Group).

Performance ratings of the subjects undergoing high stress training were obtained under different headings as enumerated above. These scores were tabulated separately for normal and aberrant groups. The means of these scores in the two groups did not reveal any significant difference.

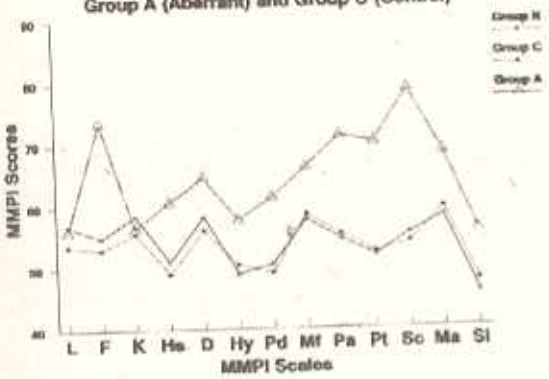
Data Analysis : Subjects in Normal and Aberrant High Stress groups were compared for their socio-demographic characteristics. No significant differences were found. Performance Ratings in Normal and Aberrant Groups of high stress were analyzed using t-test. No significant differences were observed. MMPI scores on individual scales in the three groups; Normal and Control as well as Normal and Aberrant, were compared by means of t-test. The comparison between group N and C is given in Table I and the comparison between Group N and A is presented in Table II. The graphical representation of the personality profiles in the three groups is depicted in Fig. A regression analysis was performed on scores of the Normal and Aberrant Groups using MMPI data as predictors and performance ratings as dependent variables. This is presented in Table III.

MMPI profiles of Group N, A and C show that the mean profiles of subjects in Group N and C are identical (Table I and II, Fig), so much so, that their profile lines in Fig seem to merge. Their T-scores remain between 45 and 60 on all the scales with scores of Mf and Ma being close to 60 and score on Si being 45.7. On the other hand, T-scores of subjects in Group A show significant differences in all scales with exception of L, K and D scales. Scores exceed 70 on F, Pa, Pt and Sc

Table III : Regression analysis of Gp N (Normal) and Gp A (Aberrant)

	NORMAL GROUP				ABERRANT GROUP			
Indepedent Variable (MMPI Scales)	Dependent Variable (Flying Perf.)	R Square	Beta	Significance	Dependent Variable (Flying Perf.)	R Square	Beta	Significance
Hs					IFT	0.66	-0.55	p<0.05
D	Overall	0.20	-0.44	p<0.05				
Hy	NFT	0.19	-0.48	p<0.05	IFT	0.47	1.02	p<0.001
Pd								
Mf	LLNT	0.33	-0.58	p<0.01	PNT	0.33	0.75	p<0.001
	CFT	0.48	-0.58	p<0.01				
PA					PNT	0.81	0.46	p<0.001
Pt	IFT	0.25	0.49	p<0.01	Range	0.40	0.63	p<<0.05
Sc	Range	0.21	-0.45T	p<0.05	PNT	0.62	0.58	p<0.001
Ma	Aero	0.28	0.53	p<0.01	Aero	0.50	0.71	p<0.01
					NFT	0.31	0.56	p<0.05
Si	CFT	0.20	0.66	p<0.01				

Fig : MMPI Profile of Group N (Normal), Group A (Aberrant) and Group C (Control)



scales, and lie between 60 and 70 in D, Pd, Mf and Ma scales, and below 60 in all the other scales.

Regression Analysis (Table III) : Group N shows negative correlation with D, Hy, Mf, Sc and positive correlation with Pt, Ma and Si. On the other hand, Group A shows negative correlation with Hs and Hy, and positive correlation with Mf, Pa, Pt, Sc and Ma. Thus, positive correlation with Pt and Ma and negative correlation with Hy, are the only shared factors highlighted by the regression analysis. Further, highly significant correlations were observed with Mf and Si in Group N, and Hy, Mf, Pa, Sc, Ma in the Aberrant Group. Performance ratings in Aerobatics, were significantly predicted by the scores on Ma scale in both the groups. Interestingly, performance rating of pilot navigation training (PNT) was also linked with pathological findings in Group A, e.g. positive correlations with mf, Pa and Sc scales.

Discussion

Our results on personality profiles show that Group N (normal) subjects obtained identical MMPI profile to Group C (control) subjects. Admittedly, our Group C subjects had faced minimal stress during their training and they had adequate military experience to cope with the training demands without showing any signs of strain. On the other hand, Group N subjects had to face severe stress as brought out earlier. Obviously they were able to cope with it without showing any repercussions on their personality profile. This suggests that the high-stress demands of training met with effective problem solving owing to good P-E match in this group. Interestingly, their relatively high scores (57.7) on Mf show a negative correlation with performance ratings. Similarly, comparatively low scores on Si (45.7) show a positive correlation with performance ratings in this group. This means that optimum personality profile for best success during flying training is the one which shows balanced personality traits, with a profile line traversing through various scales in the region of a T score of 55 in all MMPI scales, with a slight elevation on Ma scale.

On the otherhand, our subjects in Group A (Aberrant) showed a gross abnormality in their mean personality profile as compared to their counter-parts in Group N. They also showed use of aberrant mechanisms in adapting to the high stress demands as demonstrated by an abnormal correlation pattern with various performance ratings. Their overall similarity in performance ratings as compared to the Normal Group, tends to minimize the essentially dysfunctional nature of their P-E interactions during the stressful flying training. Further the study helps us to highlight that, for indeterminate reasons, it is the phase of navigational training that seemed to have posed maximum difficulties for them. In the light of this finding we should carefully examine various attitudinal and personality factors as well as methods of instruction in use during navigational training.

The explanation for the disparity in MMPI profiles between our Normal and Aberrant Groups in the high stress experimental condition, can not be spelled out with any degree of certainty. However, we hypothesize that our Aberrant Group subjects probably perceived themselves as unequal to the challenge imposed by the stressful training and used some defensive mechanisms while continuing to perform well during the training. Theregression analysis provides some insight into the nature of stress. From this it is clear that probable area of stress in our aberrant group was greater concern for performance on navigational tasks compared to the normal group. This finding should lead us to an in depth study of aptitudinal and personality

factors involved in better appreciation and performance of navigational tasks during flying.

Christy[10] advocated elimination from flying of candidates who show deviant personality traits. He predicted that those trainees who are over-determined, counter-phobic, highly ambivalent or have neurotically oriented drives, will show signs of decompensation sooner or later. Can we draw a parallel between our aberrant group and Christy's deviant group. There is no anecdotal evidence to indicate eventual breakdown of our subjects in the aberrant group. However, it will be vital to follow up the behaviour of our aberrant Group during their future encounters with stress.

This study also shows that MMPI is a sensitive index for studying P-E interactions in a complex flying environment. The findings in this study should stimulate further research on various aspects of stress adaptation in the actual field conditions of aero-space operations.

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