Brit. J. Psychiat. (1970), 117, 535–44

Treatment of Aviation Phobias by Behaviour Therapy

By A. B. GOORNEY

Introduction

Since the 1914–1918 war, when high psychiatric casualty rates were recorded amongst military aircrews, a considerable amount of research has been focussed on the psychiatric problems associated with aviation. Reported symptoms have included morbid anxiety, lethargy; anorexia, weight loss; restlessness, tremors, palpitations; depression, insomnia, nightmares; personality changes, loss of flying skills and avoidance of risks. Diverse opinions have been expressed on the genesis and therapeutic management of the syndromes. Some authors have drawn attention to the so-called neurasthenic features and concluded that the symptoms were predominantly physiogenic, reflecting a state of exhaustion arising from neural, biochemical or other mechanisms (e.g. Ferry, 1919; Josué, 1919; Head, 1919; Flack, 1920; Porton, 1936; Miller, 1936; Lottig, 1937; Walshe, 1941; Cobb, 1942). Some have distinguished between 'neurasthenic' symptoms and overt anxiety, ascribing the former to physical exhaustion and the latter to neurotic disturbance in predisposed individuals (e.g. Gotch, 1919; Armstrong, 1936; Hastings *et al.* 1944; Murray, 1944). Others have regarded all symptoms as manifestations of neurotic reactions, though diverse views have been expressed regarding the supposed psychogenic mechanisms (e.g. Rivers, 1920; Birley, 1920; Rook, 1939; Symonds, 1947; Grinker and Spiegel, 1944; Wegrocki, 1946; Bond, 1952; Gatto, 1954; Sours *et al.* 1964; Morgenstern, 1966).

Treatment based on the various physiogenic hypotheses has invariably consisted of rest by temporary grounding, sometimes with additional measures such as physical exercises (Flack, 1920; Lottig, 1937; Walshe, 1941; Murray, 1944); and hydrotherapy (Armstrong, 1936; Politeur *et al.* 1958). Where psychogenic mechanisms were evoked, psychological and physical methods of treatment were proposed, as for other manifestations of neurotic disorder. *Physical treatments* have included sleep narcoses (Hastings *et al.*, 1944; Grinker and Spiegel, 1944), ergotamine tartrate, hyoscine (Grinker and Spiegel, 1944), sedatives, tranquillizers and antidepressants. Recommended forms of *psychotherapy* have varied from simple supportive measures to more intensive procedures towards rectification of presumed psychodynamics. Examination of the literature shows the familiar pattern of conflicting evidence regarding the value of a transference relationship and of the acquisition of insight into putative dynamic mechanisms (e.g. Reinartz, 1932; Anderson, 1948; Von Hattingburg, 1950; Erlich and Philips, 1963). *Abreaction* without therapeutic use of revealed material was considered of little value (Grinker and Spiegel, 1944; von Hattingburg, 1950). '*Desensitization*' was one of the first therapeutic methods to be described (Wells, quoted by Anderson, 1919). Wells and Anderson reintroduced their patients to flying through a hierarchy of graded steps, assisted by a flying instructor. This method, which they called 'slow recovery', had much in common with routine techniques of flying training.

In a retrospective study of effectiveness of therapy Goorney and O'Connor, (1970) found that two-thirds of the men treated by desensitization of the type described by Wells and Anderson returned to full flying duties after an average of 10 months treatment, whilst of the total series (the majority of whom had been treated by various other methods) only 26 per cent returned to full flying duties. The relative effectiveness of treatment by graded re-exposure to flying suggested an investigation of the application of systematic desensitization to flying anxieties. The present paper records the method and results achieved with the first six cases so treated by the author.

Method

The treatment method was based on systematic desensitization in imagination during relaxation (Wolpe, 1958). Techniques were modified to foster the ability to self-induce and maintain relaxation in the presence of anxiety-provoking stimuli, rather than to avoid anxiety by reducing the stimulus strength. A further modification of Wolpe's techniques was the repetition in reality of the desensitization hierarchy completed in imagination.

Treatment was carried out in three stages. The preliminary stage was confined to investigating the precise circumstances in which the symptoms had developed, discussing techniques, working out relevant hierarchies, instruction and practice in self relaxation, and treatment by desensitization of any non-flying phobias.

In the second stage, desensitization in imagination of the flying anxieties was effected during progression up hierarchies of anxiety-provoking conditions. A narrative of the flying exercises was vocalized by the therapist, who drew upon his own experiences as a pilot to describe relevant body sensations and emotions. The patients were not expected to react without appropriate anxiety when exposed in imagination to situations which would in fact evoke increased arousal in many aircrew. They were encouraged to hold or reverse rising feelings of anxiety evoked by imagery, rather than to ensure that such feelings did not occur, and they were asked to gauge the normality of their feelings in relation to their pre-morbid subjective experience.

The third stage, desensitization in reality, was started when the patient considered himself able to withstand the maximum intensity of stimulus in imagination, without undue feelings of anxiety. The hierarchies already covered in imagination were repeated in flight. Where a phobia was related to a form of flying more readily tackled in a substitute aircraft type, this was used before flying in the specific type in which the anxiety had originally been experienced. Change of aircraft type could be associated with continued progression up the hierarchy or reversion to earlier steps in the hierarchy before continuing progress. Initially the patients travelled to the airfield only on days they were due to fly, but they were eventually transferred to quarters on the flying station. Instructors of the Royal Air Force Central Flying School and Test Pilots of a local Unit acted as co-pilots. The therapeutic principles, the patients particular problems, and the hierarchies were discussed at joint meetings prior to commencing flying. The pace of treatment was set by the patient.

Patients and Details of Individual Treatment

The 6 patients were pilots or navigators in active flying posts drawn from 8 consecutive referrals to the R.A.F. Central Medical Establishment for psychiatric assessment of anxieties related to flying. All six were happily married with young families; all had obsessional personality traits (perfectionism, checking etc.), 5 gave histories of childhood neurotic traits, 3 of childhood timidity, 3 of parental neuroticism and one of parental psychiatric illness.

Case 1

A pilot aged 41, flying experience over three thousand hours, complained of loss of confidence in his flying abilities, fears of accident, and 'panic' attacks during flight particularly during aerobatic manoeuvres, high level or instrument flying. Additionally he feared swimming beyond his depth and driving above 40 m.p.h. After a long career as a fighter pilot instructor and aerobatic display pilot, he had been transferred to flying helicopters. In this, anxiety and feelings of depersonalization had appeared. He continued to fly helicopters for 2 years, crashed and nearly drowned. On return to fixed wing aircraft flying he had received a 'refresher' course during which anxiety and feelings of depersonalization at high altitude were experienced. The symptoms had increased in severity and frequency to progressively widespread stimuli despite physiological investigations and psychological support. The swimming phobia had dated back to the helicopter accident, and the driving fears were of recent origin.

Relaxation, indoctrination and treatment of the swimming phobia was completed at the Maudsley Hospital prior to starting flying desensitization. The flying hierarchies, undertaken first in imagination and then in reality in piston- and jet-engined training aircraft, progressed through systematic exercises to include the complete flying training syllabus. The fast-driving fear was treated in reality during the journeys to and from the airfield.

The total programme was completed in four months, including 20 hours of therapeutic flying. The patient was re-assessed as an instructor, obtained the highest category, and returned to instructional duties. He has remained symptom-free for nearly 36 months.

Case 2

A pilot aged 36, flying experience over two thousand hours, complained of anxiety in relation to flying in cloud. The anxiety increased proportionally to the thickness and altitude of the cloud layer. He had previously experienced feelings of anxiety and detachment when flying alone at high altitude in fighter aircraft. The present symptoms had appeared during training to become a jet instructor. He completed the course, but before commencing instructing he had flown on two occasions in extremely bad weather conditions; he had experienced considerable anxiety, and reported to his Medical Officer. During discussions prior to treatment the patient revealed a life-long history of claustrophobia, which had also been experienced by his mother.

The claustrophobia was treated by systematic desensitization in enclosed flight simulators. The flying desensitization hierarchies were based on flying in increasing thickness of cloud at increasing heights. The programme was extended to nearly 6 months, including 34 hours of therapeutic flying, due to delays whilst waiting for suitable weather conditions to achieve the hierarchical progression. After re-assessment the patient returned to instructional duties on the aircraft in which the symptoms had occurred. He has remained symptom free for over 36 months.

Case 3

A pilot aged 25, with flying experience 900 hours, complained of loss of confidence in himself as a flying instructor and doubts of his ability to cope with flying emergencies. He had experienced no flying anxiety until an accident the previous year in which he had been seriously injured and his student killed. On return to flying he had felt anxious and experienced abdominal pain. The symptoms resolved within three weeks and he resumed instructing. Six months later he began to feel 'run down', tense and dyspeptic; his condition deteriorated despite a period of leave. After in-patient physical examination had proved negative he was referred for psychiatric opinion.

The desensitization programme consisted of a hierarchy of instructional exercises undertaken first in imagination and then in reality in the aircraft type in which he had been instructing, and a second hierarchy, in imagination only, of flying emergencies of an anxiety-provoking nature. The programme was completed within six weeks, including 16 hours of therapeutic flying. After re-assessment the patient resumed instructional duties on the aircraft in which the accident had occurred. He has remained symptom-free for over 36 months.

Case 4

A navigator aged 30, with flying experience over 2,000 hours, complained of nausea, tension and a compulsive desire to fire his ejection seat during flight. Seven years previously, during a flight involving continuous violent manoeuvres, he had become nauseated and disorientated, and experienced an urge to get out of the aircraft by the quickest method (the ejection seat). Following this episode he had suffered nausea and the urge to fire his ejection seat with increasing frequency and intensity, particularly at high altitudes and during high-speed manœuvres. The symptoms were partially controlled by leaving the safety lock in the seat-firing mechanism. He also developed compulsions unrelated to flying. He completed his squadron tour without divulging his symptoms; then he was posted to a different operational jet aircraft in which he did not have an ejection seat. The symptoms disappeared immediately, but returned immediately when he was transferred back to the original aircraft type, and recurred on every subsequent flight for three months before he reported to the Medical Officer.

The desensitization hierarchies progressed from sitting on a 'live' ejection seat in a grounded aircraft to increasingly stressful flying in the aircraft type in which the symptoms had been experienced. The programme was completed within one month, including 9 hours of therapeutic flying. The patient returned to flying in the aircraft in which his complaints had occurred. He has remained symptom free for over 36 months.

Case 5

A trainee navigator aged 27, with flying experience 200 hours, complained of anxiety and blurring of vision when looking down at the ground from the aircraft. He was symptom-free in an enclosed cabin without external vision, except during low level flight or if not sitting in his ejection seat. The complaints had been present from the start of flying training, and increased in intensity after he graduated from piston engined to jet aircraft. He began to experience feelings of tension, irritability, insomnia and anorexia between flights. He eventually reported his visual difficulties. After ophthalmological investigations had failed to reveal abnormality, he admitted to his other complaints, and to a history of timidity and physical underconfidence.

Therapy was initially concentrated on physical underconfidence by hierarchies of swimming and trampoline exercises. These were followed by a height hierarchy, climbing external ladders to an eventual height of 50 feet. After completion of these hierarchies in imagination and reality, flying desensitization was commenced. The first hierarchy consisted of hovering in a helicopter at increasing heights up to 800 feet. This was followed by hierarchies based on lying, for increasing periods, in the downward viewing positions in piston- and jet-engined aircraft, and movement from the ejection seat to this position during flight in jet aircraft.

The programme was completed within six months, including 45 hours flying. The patient then finished his flying training, joined an operational squadron and has remained symptom-free for over 24 months.

Case 6

A navigator aged 24, with flying experience over 800 hours, complained of incapacitating air-sickness. Air-sickness had occurred on his first flight, and continued throughout training whenever weather conditions were turbulent. After he graduated to jet aircraft, sickness occurred with increasing frequency and decreasing stimulus. It eventually occurred in calm conditions, and was finally evoked merely by the smell or sight of aircraft or flying clothing. Despite the sickness he completed the

training courses and efficiently performed his squadron duties for eighteen months, only seeking medical advice (other than anti-emetics) after retching had resulted in haematemesis.

The desensitization hierarchies covered all pre-flight procedures, followed by flying in conditions of increasing turbulence. Part of the desensitization in imagination programme was completed in a grounded aircraft during which the patient wore an increasing number of items of his flying clothing.

Desensitization in imagination was completed within three weeks. The first two flights were symptom-free. In the next two flights the patient was inadvertently exposed to violent manoeuvres and again experienced nausea and apprehension. Further attempts to desensitize in imagination and in reality were unsuccessful, and the patient requested termination of treatment. He was transferred to restricted flying duties.

Psychometric Assessment

A flying situation anxiety scale and two personality inventories (M.P.I. and M.M.P.I.) were administered before starting therapy, after completing therapy and at the six month follow-up. Means and standard deviations for each of these have previously been established for 'normal' R.A.F. aircrew in current flying practice (Goorney, 1970 a, b).

Anxiety Scale

The anxiety scale was designed to measure, on linear horizontal scales, levels of subjective anxiety for the flying situations specified in Table 1A. The left end of each scale represents maximum anxiety, and the right complete relaxation. The patients were requested to place marks on the scales to indicate the levels of anxiety they considered they would experience in the situations and aircraft specified.

The situations for which the pre-treatment scores of each patient were raised by more than two standard deviations above the normal aircrew means are given in Table 1B, with the approximate number of standard deviations by which they were raised. The situations for which the post treatment scores remained raised by more than one standard deviation above the normal aircrew means at follow-up are also given in the Table.

Table 1A

General flying (V.M.C.)

1. Light training aircraft
   (a) Piston Engined
   (b) Jet
2. Advanced training aircraft
   (a) Piston Engined
   (b) Jet
3. Operational aircraft
   (a) Fighter
   (b) Bomber
   (c) Transport

Specific flying situations

4. High altitude
   (a) In aircraft in which most anxiety would be experienced
   (b) In aircraft in which least anxiety would be experienced
5. Low level
   (a) In aircraft in which most anxiety would be experienced
   (b) In aircraft in which least anxiety would be experienced
6. Flying in cloud
   (a) In aircraft in which most anxiety would be experienced
   (b) In aircraft in which least anxiety would be experienced
7. Aerobatic manoeuvres
   (a) In vertical plane
   (b) In rolling plane
   (c) Spinning
   (d) Stalling

The pre-treatment scores generally reflect the presenting complaints. The post-treatment and follow-up scores are in accord with clinical improvement, except in Case 3 where there appeared to be some deterioration between post-treatment and follow-up scores despite continued symptom-free flying. Case 4 continued to express anxiety in regard to fighter aircraft, in which he had never flown. Case 6, despite abandoning therapy, indicated some reduction of anxiety in all situations.

M.P.I.

In Table II mean Neuroticism and Extraversion scores for the patients are compared with the 'normal' R.A.F. aircrew means. (The 'normal' aircrew means differ significantly from the general population means (Goorney 1970 a).)

The pre-treatment Neuroticism scores were elevated above the normal aircrew mean in all six patients, in three (cases 1, 2 and 4), by approximately 1 S.D., in two (cases 3 and 5) by over 2 S.D. The Neuroticism scores changed during treatment and follow-up, from figures

https://doi.org/10.1192/bjp.117.540.535 Published online by Cambridge University Press

TABLE IB

Case	Main clinical features	Anxiety scales with scores raised above 'normal' aircrew means					
		Pre-treatment Scores raised > 2 S.D.			Post-treatment (Follow up) scores raised > 1 S.D.		
		Areas of concern	Scales	S.D.s above mean	Areas of concern	Scales	S.D.s above mean
1	Anxiety, all aspects of flight. Most severe, high altitudes and aerobatics	Training aircraft. Operational aircraft. High altitude. Aerobatics. Flying in cloud	1a, 1b, 2a, 2b, 3a, 4a, 4b, 6a, 6b, 7a, 7c	2 to 6½	None		
2	Anxiety flying in cloud or at high altitudes	Flying in cloud High altitude	4a, 6a, 6b	2 to 3	None		
3	Loss of confidence in ability as an instructor	Training Aircraft	1a, 1b, 2a, 2b, 3b, 3c	2 to 7	Training aircraft Operational aircraft Flying in cloud	2a, 3c, 6a	1½ to 3
4	Compulsion to fire ejection seat in specified aircraft type	Specific aircraft Fighter aircraft	3a, 4a, 5a, 6a	2 to 3	Fighter aircraft	3a	1½
5	Anxiety all flying, Most severe when looking at ground or leaving ejection seat	Training aircraft Operational aircraft. Low level. Flying in cloud. Aerobatics	1a, 1b, 2b, 3a, 4a, 5a, 6a, 7a, 7b, 7c, 7d	2 to 4	None		
6	Nausea and anxiety all aspects of flying	Operational aircraft Training aircraft. Flying in cloud. Aerobatics	1a, 1b, 2b, 3a, 3b, 6a, 7a, 7b, 7c, 7d	2 to 4	Training aircraft Aerobatics	2b, 7a, 7c	1½ to 3½

above the normal aircrew mean to figures at or below the mean. For the five who effected a full recovery the level of significance between pre-treatment and follow-up scores just fails to attain the 5 per cent level of probability ($t = 2 \cdot 21$).

The pre-treatment Extraversion scores were below the 'normal' aircrew mean in four out of six patients, in three (Cases 3, 5 and 6) by over 1 S.D. Extraversion scores increased between pre-treatment and post-treatment in all six patients. Further increases were noted in four cases between post-treatment and follow-up. The follow-up Extraversion scores were raised above the normal aircrew mean. The difference between the pre-treatment and follow-up extraversion mean scores is significant at the 1 per cent level of probability ($t = 4 \cdot 98$).

THE MMPI

In Table III, MMPI raw score means of the patients are compared with the raw score means for 'normal' populations of R.A.F. and American Air Force aircrew in active flying posts.

https://doi.org/10.1192/bjp.117.540.535 Published online by Cambridge University Press

TABLE II

M.P.I. scores—Comparison of study cases with aircrew and general population norms

	Normal		Present study			
	General population (Eysenck 1959) (n 1800)	Aircrew (Goorney 1970) (n 50)	Pre-treatment (n = 6)	Post-treatment (n = 6)	Follow up (n = 5)	't' Pre-treatment to follow up
Neuroticism	19·89 (S.D. 11·02)	11·42 (S.D. 8·76)	25·8	21·6	15·2	2·21
Extraversion	24·91 (S.D. 9·71)	29·04 (S.D. 9·73)	24·2	32·4	35·2	4·98

TABLE III

MMPI raw/score means patients and 'normal' aircrew

Scales	Normal aircrew			Present series		
	USAF mean	RAF mean	S.D.	Pre-treatment	Post-treatment	't' (cases 1–5)
K	17·8	17·8	4	16·0	17·2	0·61
Hs	2·3	2·1	2·1	4·3	1·7	1·54
D	16·9	18·6	3·7	21·7	17·3	2·23
Hy	18·8	19·7	3·6	22·3	18·8	3·06
Pd	14·4	12·4	3·6	13·8	11·3	1·55
Mf	21·7	23·4	4·8	26·5	26·2	0·59
Pa	8·3	7·7	2·4	9·5	9·2	0·34
Pt	5·7	5·8	5·2	13·7	6·7	1·87
Sc	5·0	5·8	4·6	9·8	5·8	1·08
Ma	16·0	14·5	3·9	16·0	14·5	0·91
Si	19·3	21·6	8·1	24·0	17·0	1·76

The 'normal' R.A.F. figures (Goorney, 1970 a): are closely similar to the American Air Force figures (Fulkerson *et al.*, 1958) which have been shown by Fulkerson *et al.*, to differ from the original MMPI normative data by significantly raised scores on the K, Hy and Ma scales, and significantly lowered scores on the Hs, Pt, Sc and Si scales.

The patients' pre-treatment scores differed from the normal aircrew figures, and resembled the original normative data on the Hs, Pt, Sc and Si scales, but diverged still further on Hy and Ma. After treatment the patients' scores reverted to the normal aircrew means on all scales.

The differences between pre-treatment and post-treatment scores were most apparent on the Hy; D; Pt; Pd; and Hs scales though only at significant level ($p < 0.05$) on the Hy scale.

DISCUSSION

Previous reports of the results of deconditioning aviation phobias have been disappointing. Anderson (1919) recorded no success, and neither Wells nor Ironside and Batchelor published any results. Goorney and O'Connor (1970) noted that 8 out of 12 cases returned to full flying duties in a mean time of ten months. The limited successes and long duration of therapy in the earlier series may well reflect inadequate structuring of therapeutic programmes, and also failure to appreciate the importance of imagination in anxiety.

A major source of distress reported by aviators who have experienced anxiety in flight is loss of confidence in their ability to 'control' their anxieties and consequent apprehension regarding their capacity to calmly initiate rapid and constructive thought and action in an

emergency. Systematic desensitization to the multiplicity of anxiety-provoking situations which can arise in the flying of military aircraft is a practical impossibility. Furthermore, it could prove dangerous by conditioning the man to a series of hierarchies, whereas many flying emergencies contain unique features requiring rapid overall assessment and immediate action.

The therapeutic method described in this paper was developed to provide treatment of the patients' inability to consciously control anxiety, as well as for treatment of the specific phobias. The hierarchies based on the presenting complaints were used to enable the patients to practise conscious control over anxiety in graded steps of meaningful anxiety-provoking situations. Repetition during flight of the hierarchies covered in imagination enabled the patients to test their abilities to inhibit anxieties in reality, including those arising from stimuli not covered in the imagination programme.

In the writer's opinion it is doubtful whether the therapeutic regime is completely analogous to 'reciprocal inhibition' as described by Wolpe (1958). It is suggested that restoration of emotional control played an important part in treatment; that this was an active learning process rather than inhibition or habituation, and led to extinction of the apprehensive aspects of anxiety through non reinforcement.

Although a control study was not feasible, the results obtained with men suffering increasing symptoms (which in two cases had resisted previous therapy) compare favourably with those of other published reports. Overall figures for a return to full flying are about 20–25 per cent (Gillespie, 1940; Hastings *et al.*, 1944; Air Publication 3139, 1947; Goorney and O'Connor, 1970). Figures markedly at variance with these have usually been obtained by selection or by inclusion of patients experiencing symptoms other than overt anxiety (Reinartz, 1932; Grinker and Spiegel, 1944; Billings, 1959; Ehrlich and Philips, 1963; Sours *et al.* 1964); or else they have been obtained with men exposed to excessive flying and diagnosed as 'operational' or 'flying fatigue' (Gotch, 1919; Tillisch and Walshe, 1942; Hastings *et al.*, 1944).

Although our patients were selected by symptom presentation and motivation for treatment, all revealed aspects noted by others to affect prognosis adversely for a return to flying. One case (treated successfully) showed every recognized reason for prognostic pessimism: family psychiatric history, persistent neurotic traits and timidity from childhood, markedly obsessional personality, and incapacitating symptoms developing during training. Gotch (1919) recorded family histories of neurosis or mental instability in 167 out of 200 cases. He concluded that evidence of genetic predisposition afforded a bad prognosis for return to flying. Anderson (1919) shared this opinion and emphasized the ominous significance of breakdown early in the flying career. Gillespie (1940) and Ironside and Batchelor (1945) held similar opinions and particularly noted the adverse effects of childhood timidity on prognosis. Symonds (1942) described an inverse relationship between 'psychiatric predisposition' and total stresses withstood before incapacitating psychiatric symptoms appeared. Slater (1943) recorded the prevalence of personal and family psychiatric histories in military psychiatric casualties, and considered these to reflect a 'neurotic constitution' of genetic basis with poor prognostic implication. Goorney and O'Connor (1970) noted an adverse effect of personal psychiatric predisposition on prognosis for return to flying, but like Symonds (1943) found no relationship with family psychiatric history.

Aircrew selection is rigorously enforced to screen out the psychiatrically predisposed. It might therefore appear surprising to find men with 'psychiatric predisposition' amongst military aircrews. There can be few people, however, in whom some 'psychiatric predisposition' cannot be found in retrospect by applying suitable criteria. Symonds (1942) attempted to assess where the aircrew selections cut-off line should be drawn. In a study of 100 psychiatric casualties, he found severe degrees of predisposition in 25 per cent of those who had successfully completed numerous stressful operational flights before breakdown. Hastings *et al.*

(1944) found histories of pre-existing 'neurotic instability' in 50 per cent of a group of 150 successful combat pilots. Goorney (1970b) noted 'psychiatric predisposition' in 42 per cent of a control population of 'normal' aircrew, using similar criteria to those employed in the study of aircrew anxiety casualties. These findings are not incompatible with the evidence of adverse effects of 'psychiatric predisposition' on *relative* susceptibility to breakdown under stress, but emphasize the need for strict criteria when assessing a pre-selected group.

The 'flying situation anxiety scale' employed in this study was designed to obtain quantitative measures of the nature and subjective strength of the phobic anxieties and the effectiveness of therapy. Pre-treatment scores were markedly raised only in the situations nominated in the presenting complaints and dropped to near normal following treatment. The scores therefore reflected the clinical conditions, and confirmed the value of the scale as an indicator of anxiety level. The MPI and MMPI scores also reflect the changing clinical status. Pre-treatment MPI Neuroticism scores were elevated and Extraversion scores depressed in comparison with 'normal' aircrew means. Post-treatment figures reverted to the normal aircrew means. The changes were beyond the 1 per cent level of probability for Extraversion and near the 5 per cent level for Neuroticism. The mean pre-treatment MMPI scores were raised above the 'normal' aircrew means on all the scales except 'K'. They reverted to the 'normal' aircrew means after treatment.

Reversible changes in the MPI, with raised Neuroticism and lowered Extraversion scores during depressive illness, have been noted by Coppen and Metcalfe (1965) and by Kendel and Di Scipio (1968). Similar reversible changes in neurotic illness have been reported by Ingham (1966). Although test-retest unreliability of the MMPI has been demonstrated (Windle, 1955, Britton and Savage, 1966) and may account for the MMPI and MPI changes noted in this paper, the possibility remains that personality measures are influenced by the attitudes and psychological state of the patients at the time of completing the inventories.

The importance of establishing means for a selected population is clearly apparent in the significant differences between the 'normal' aircrew and general population means both on the MPI and the MMPI. Relative to the 'normal' aircrew MPI means, the pre-treatment scores of all the patients corresponded with the category described by Eysenck (1959) as 'dysthymic neurotic' within which term he included anxiety states and phobias. Relative to the general population figures, however, the pre-treatment scores of all six inpatients were within normal limits. The pre-treatment MMPI scores of the patients on the majority of the scales were close to the raw scores calculated from the original general population data by Fulkerson *et al.* They were, however, at variance with the 'normal' aircrew means, which are remarkably similar for both R.A.F. and U.S.A.F. flying personnel.

Follow-up has been maintained for over three years on the five cases who returned to full flying duties. The fact that all five have remained symptom-free and have successfully continued their careers is not unexpected in view of the frequency of reinforcement of learning afforded by continued symptom-free exposure to the flying environment. These findings encourage the opinion that a systematic regime of desensitization in imagination and in reality is economically short (average three months) and offers a good prognosis for aviators suffering from focal anxiety symptoms associated with flying.

Summary

Six experienced aviators, incapacitated by anxiety related to flying were treated by behaviour therapy (controlled relaxation and systematic desensitization). Five returned to full flying duties and have remained symptom-free for over three years; the sixth returned to limited flying duties.

Flying Anxiety rating scales, MPI and MMPI were completed by the patients before and after treatment. These measures were compared with normal aircrew means. The rating scales reflected the specific areas of anxiety, with scores significantly raised before treatment and reverting to the normal means after treatment. Compared with relevant controls, the MPI

'N' scores were elevated and 'E' scores depressed before treatment; after treatment both reverted to the normal aircrew means. These changes were singificant. The MMPI pre-treatment scores were raised on most scales and reverted to the normal aircrew means after treatment.

The therapeutic method and the psychological measures are discussed. It is emphasized that apprehension of loss of ability to consciously suppress fear is an important source of anxiety amenable to correction by re-education.

ACKNOWLEDGEMENT

The author wishes to express appreciation to Professor M. G. Gelder who initiated the treatment of the first patient at the Maudsley Hospital and whose advice in the framing of the project was invaluable; to the senior officers of the Royal Air Force who supported the project in particular Air Commodore O'Connor, Consultant Adviser in Neuropsychiatry and the pilots who participated; to Dr. I. M. Marks and Dr. R. H. Cawley of the Maudsley Hospital for their aid in preparing the paper; to the Director General of Medical Services Royal Air Force, for permission to publish.

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(*Received 18 April 1969*)