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EDGEWOOD ARSENAL TECHNICAL REPORT

EATR 4536

STUDIES OF THE EFFECT OF PERSONALITY ON REACTIVITY TO LSD

by

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Task 1B662706AD2503

**DEPARTMENT OF THE ARMY
EDGEWOOD ARSENAL
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Edgewood Arsenal, Maryland 21010**

FOREWORD

The work described in this report was authorized under Task IB662706AD2503, Prophylaxis and Therapy for Incapacitating Agents. The experimental work was started in 1962 and completed in 1966.

The volunteers in these tests are enlisted US Army personnel. These tests are governed by the principles, policies, and rules for medical volunteers as established in AR 70-25.

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DIGEST

Case records of 52 Army volunteers given from 1.1 to 2.0 $\mu\text{g}/\text{kg}$ of LSD orally between 1962 and 1966 were studied. Since 1966 no further studies have been performed. Significant relationships were found between personality (as measured by the Minnesota Multiphasic Personality Inventory and Army General Intelligence Test) and performance following administration of LSD. Resistant subjects at lower doses were found to be more intelligent, energetic, and outgoing. Sensitive subjects were less intelligent, constricted, more anxious, over-controlled, and dependent. At the higher doses the picture was not as clear, but personality factors were still highly correlated with performance. The Pa (paranoia) scale had a higher correlation with performance than did dose. The K (positive test-taking attitude), Hs (hypochondriasis), and Si (social introversion) scales were positively correlated with performance at lower doses and negatively correlated with performance at higher doses.

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STUDIES OF THE EFFECT OF PERSONALITY ON REACTIVITY TO LSD

I. INTRODUCTION.

The general clinical impression has been that people who have severe reactions to LSD are likely to be borderline or prepsychotic individuals.¹ This notion is based on the study of the predrug personalities of patients who are examined after a "bad trip."

Experimental support for this clinical impression has been sparse. von Felsinger, Lasagna, and Beecher² found a relationship between the degree of drug reaction and ratings of maladjustment using the Rorschach test and psychologists' impressions. DiMascio and Rinkel³ examined two types of subjects ($n = 18$). Type "A" were selected because of low scores on the Si (social introversion), D (depression), and Mas (manifest anxiety) scales of the Minnesota Multiphasic Personality Inventory (MMPI); high scores on the Ma (manic) and Es (ego strength) scales of the MMPI; and athletic interest. Type "B" subjects were selected because of high Si, D, and Mas scores; low Ma and Es scores; and little athletic interest. The type "A" subjects reported more anxiety than type "B" during the LSD experience at the one dose level studied, whereas the type "B" subjects reported more thought clarity. Although tests of psychomotor and mental functioning were performed, no results were mentioned.

Kornetsky and Humphries⁴ compared subjective and objective measures of drug sensitivity to four of the MMPI scales when 10 normal subjects were given 50 and 100 μg of LSD. The scores on the Pt (psychasthenia) and D scales were significantly or almost significantly correlated with subjective and objective measures of drug sensitivity at the 50- μg level. Only the Hs (hypochondriasis) scale correlated significantly with objective measures of drug sensitivity at the 100- μg level.

Paul, Langs, and Barr⁵ studied the effects of 100 μg of LSD on story recall in 24 subjects. Three groups were defined prior to drug administration by a tendency to recall correctly, to subtract from, or to add to the material. Subjects who recalled the material correctly were judged to be the most resistant to the effects of the drug. These subjects were characterized by the use of repression as a defense, and they exhibited obsessive-compulsive personality features. The subjects who subtracted from the material were judged to have experienced more drug effects than the recallers. They were characterized by significantly higher intelligence scores and paranoid tendencies. Those subjects who added to the material were judged to be the most sensitive to the effects of the drug and were described as having schizoid tendencies.

The present study is based on case records of 52 subjects who received low to moderate doses of LSD in the US Army Medical Volunteer Program at Edgewood Arsenal from 1962 to 1966. Since that time there has been no further testing of LSD in the Program. In contrast to the

¹Mandel, A. *Comprehensive Textbook of Psychiatry*. ed. Freedman and Kaplan. p 249. Williams & Wilkins, Baltimore, Maryland. 1967.

²von Felsinger, J. M., Lasagna, L., and Beecher, H. K. The Response of Normal Men to Lysergic Acid Derivatives (Di- and Mono Ethyl Amides). *J. Clin. Exp. Psychopath.* 17, 414(1956).

³DiMascio, A., and Rinkel, M. Specific and Non-Specific Factors in Psychopharmacology. ed. M. Rinkel. pp 130-139. Philosophical Library, New York, New York. 1963.

⁴Kornetsky, C., and Humphries, D. Relationship Between Effects of a Number of Centrally Acting Drugs and Personality. *Arch. Neurol. Psychiat.* (78), 325-327 (1957).

⁵Paul, I. H., Langs, R. J., Barr, H. L. Individual Difference in the Recall of a Drug Experience. *J. Nerv. Ment. Dis.* 138(5), 409-423 (1964).

previously mentioned studies, which report relationships between at most three MMPI scales and drug response, significant data are reported on 21 of the 24 MMPI scales investigated. Two objective cognitive measures of performance, in addition to judgments of symptoms by the subjects, were used to measure drug reactivity. Several cases were available at each of four oral dose levels (1.1, 1.5, 1.8, and 2.0 $\mu\text{g}/\text{kg}$ and 1.5 $\mu\text{g}/\text{kg}$ following 24 hours of sleep deprivation). Significant relationships were found at each level.

An examination of the relationship between performance on cognitive tasks and personality as measured by MMPI scales and the GT (Army General Intelligence Test) score shows substantial agreement with the previous work and adds additional dimensions to personality factors bearing on drug reactivity. In addition, it was found that some personality factors that are significantly related to resistance to LSD at lower dose levels are significantly related to sensitivity at higher doses of LSD. Possible explanations for this previously unreported finding are offered.

II. METHOD.

The subjects were adult male servicemen between the ages of 18 and 29 who were screened to exclude psychiatric and physical abnormality. The standard cognitive performance test used was the Number Facility Test (NF),⁶ which consists of 18 different sets of 90 addition problems with each set being of approximately equal difficulty. The subject's score is the number of problems solved correctly in 3 minutes. All subjects were given 20 practice trials to establish a baseline. The baseline was defined as the mean of the five highest scores on the practice trials. For data analysis the mean of the subject's three lowest scores following drug administration is reported as a percentage of the baseline score.

All subjects received LSD as free base in a hospital ward setting. Vital signs and NF scores were obtained at half-hour intervals for approximately 8 to 12 hours after drug administration. Subjects who received 1.5 $\mu\text{g}/\text{kg}$ completed a Symptom Check List (Sx), which consisted of 52 items that could be rated as 0 (symptom not experienced), 1 (mildly experienced), or 2 (moderately experienced). Subjects who received 1.1 or 1.8 $\mu\text{g}/\text{kg}$ were given a Speed of Closure Test (SC),⁶ which entailed identifying words embedded among random letters.

The MMPI's were administered prior to acceptance into the Program. Computerized scoring of this test provided results for the 3 validity scales, the 10 standard scales, and 11 experimental scales. Individuals with abnormal profiles generally were excluded. All MMPI scores are reported as T scores with K (correction). GT scores were obtained from the subjects' personnel files when available.

III. RESULTS.

Figure 1 shows the relationship of performance on the NF test to dose of LSD from 1.1 to 2.0 $\mu\text{g}/\text{kg}$. The correlation coefficient is -0.3 ($P = 0.05$). It is apparent that there is wide individual variation at each dose (i.e., the NF's range from 7% to 83% at the 1.1 $\mu\text{g}/\text{kg}$ dose). The relationship of performance on the NF to the Pa (paranoia) scale of the MMPI (figure 2) for all doses studied has a higher correlation, 0.56 ($P = 0.01$).

Further examination of figure 1 reveals that the mean NF for the 11 subjects receiving the 1.1 $\mu\text{g}/\text{kg}$ dose is nearly the same as that for subjects receiving the 1.5 $\mu\text{g}/\text{kg}$ dose (44% versus 49%). Similarly, the mean for the subjects at 1.8 $\mu\text{g}/\text{kg}$ is almost the same as that for the 2.0 $\mu\text{g}/\text{kg}$ group (31% versus 34%). Therefore, it was considered justifiable to treat these four dose levels as two (1.1 and 1.5 $\mu\text{g}/\text{kg}$ being defined as low dose and 1.8 and 2.0 $\mu\text{g}/\text{kg}$ as high dose). This was done in order to make T test comparisons between resistant and sensitive subjects.

⁶Moran, L. and Mefford, R. Repetitive Psychometric Measures. Psychol. Rept 5, 269-275 (1959).

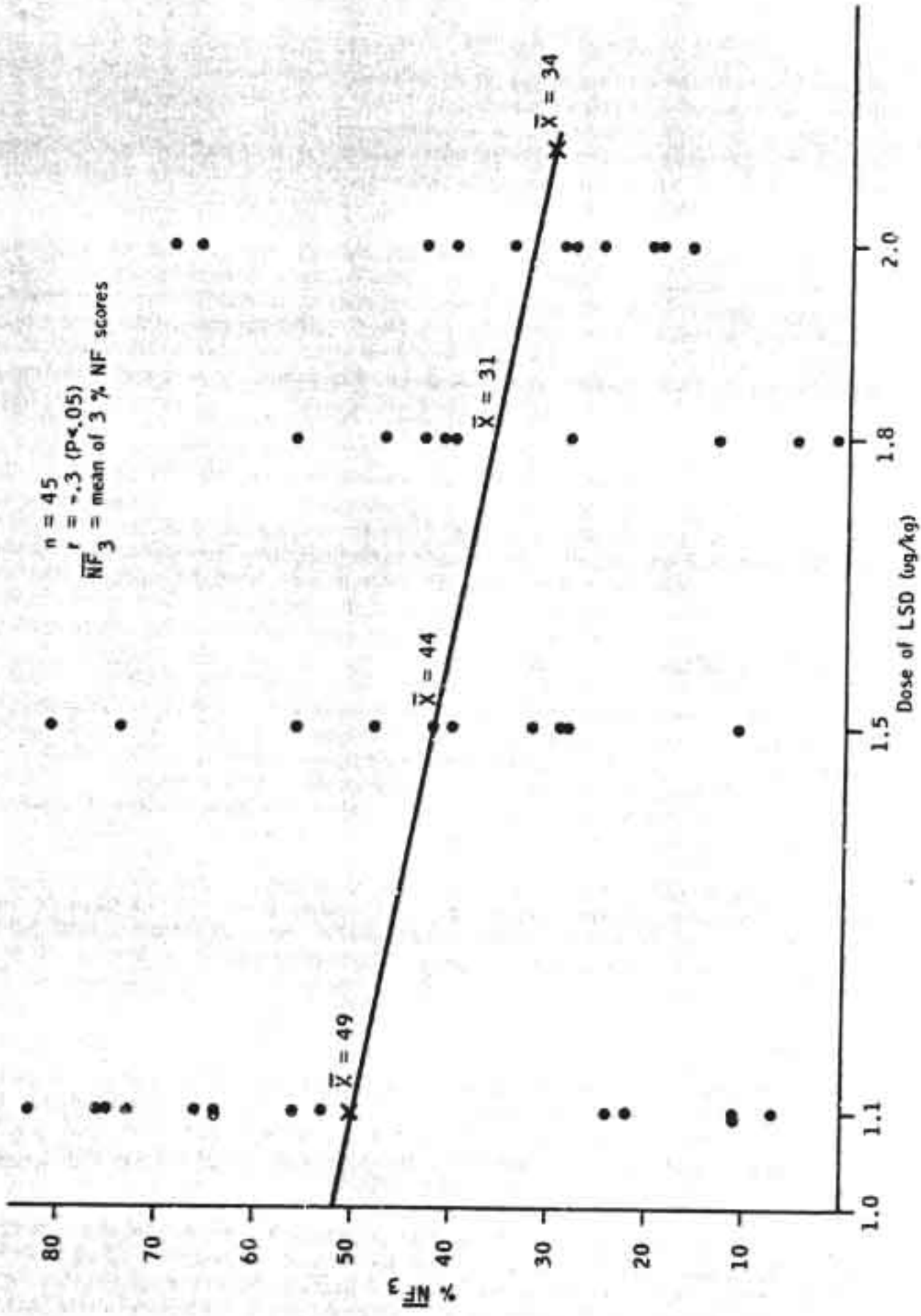


Figure 1. Performance on NF Versus Dose LSD

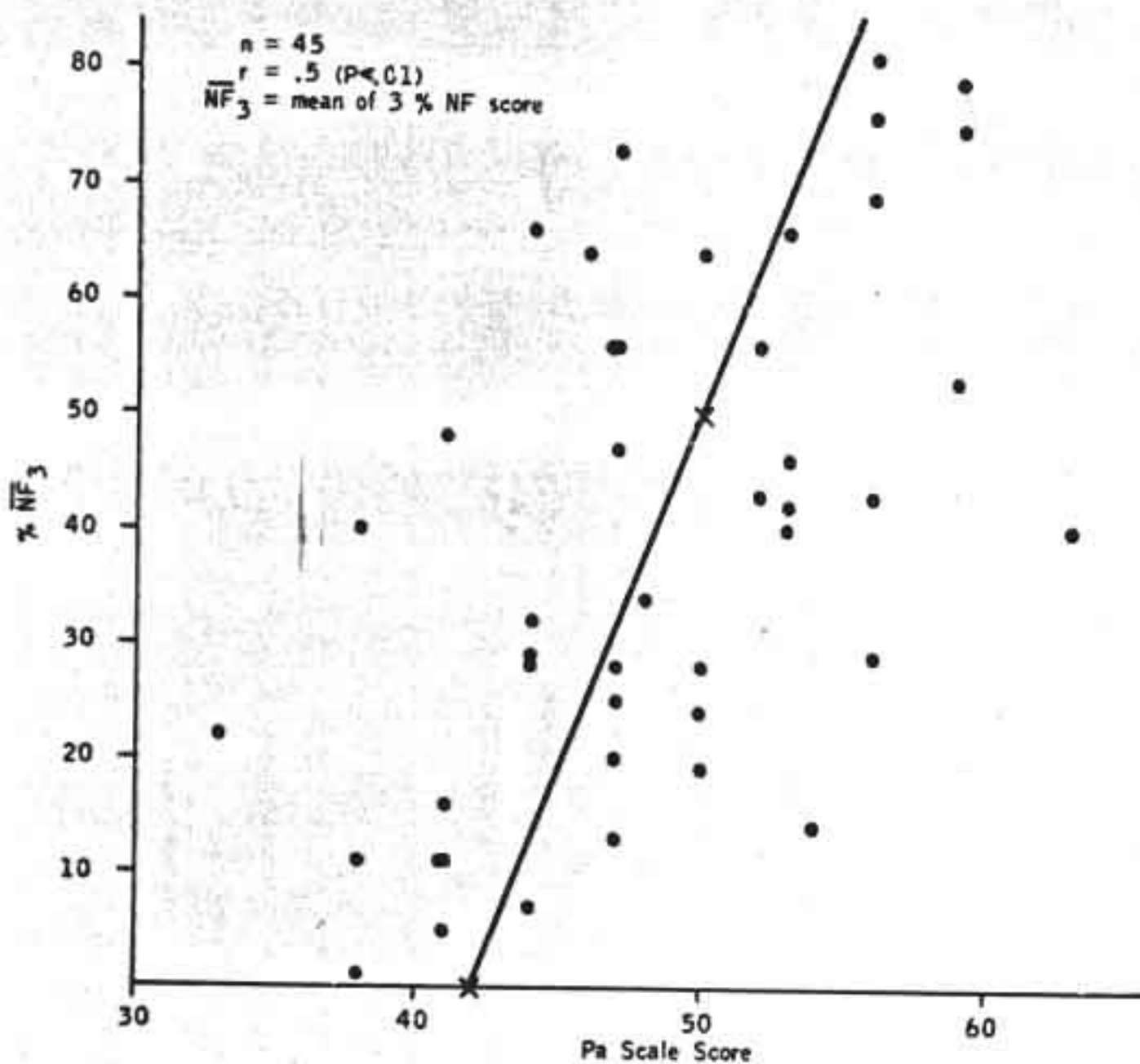


Figure 2. Performance on NF Versus Pa Scale Score (at 1.1, 1.5, 1.8, and 2.0 $\mu\text{g}/\text{kg}$)

Table I shows the correlations between the cognitive measures (NF and SC) and the personality measures (GT and MMPI standard and validity scales). Table II shows the correlations between NF, SC, and Sx and the experimental scales of the MMPI. Only those correlations that approached statistical significance are reported. The scales correlating at 1.1 and 1.5 $\mu\text{g}/\text{kg}$ are nearly identical, adding further justification for treating these doses together. When the subjects receiving these two doses are divided into two groups—a resistant group whose NF was above the mean (48%) and a sensitive group whose NF was below this level—significant differences between the MMPI's of the two groups are found (table III). The data for the two higher doses (1.8 and 1.5 $\mu\text{g}/\text{kg}$) were handled in a similar fashion (table III).

The results of the SC test (which were obtained in the same fashion as the NF scores) are included in tables I and II. At the 1.1 and 1.8 $\mu\text{g}/\text{kg}$ doses (the only doses at which subjects received

Table I. LSD Correlations: Performance Versus MMPI Scales and GT Score

Dose	N	Test	GT	MMPI scale ^a																		
				L	F	K	His	D	Hy	Pd	Pa	Pt	Ma	Si								
1.1 $\mu\text{g/kg}$	14	NF	0.65 ^b	0.70 ^b	-0.67 ^b	0.78 ^c				0.50 ^d		0.72 ^c									-0.66 ^b	
	9	SC		0.5 ^d				-0.6 ^b														-0.73 ^c
	10	NF				0.84 ^c	0.6 ^b			0.73 ^c		0.76 ^c										0.70 ^d
1.8	7	NF												-0.69 ^d								0.70 ^d
2.0	9	SC																				0.58 ^d
1.5 (sleep depr)	7	NF																				-0.68 ^b
	12						-0.67 ^b	-0.55 ^d												-0.64 ^b		

^aL = lie scale

F = unusual responses scale

K = positive test-taking attitude scale

His = hypochondriasis scale

D = depression scale

Hy = conversion hysteria scale

Pd = psychopathic deviant scale

Pa = paranoia scale

Pt = psychasthenia scale

Ma = manic scale

Si = social introversion scale

^bp < 0.05.

^cp < 0.01.

^dp < 0.1.

Table II. LSD Correlations: Performance Versus Experimental Scales

Dose	N	Test	MMPI scale ^a									
			A	Es	Lb	Ca	Dy	Do	Re	Pr	St	Cn
1.1 (µg/kg)	14	NF			0.56 ^b	-0.63 ^b	-0.60 ^b	0.5 ^c	0.51 ^c		0.51 ^c	-0.60 ^b
	9	SC			0.60	-0.61	-0.53					
1.5	10	NF	-0.65 ^b	0.77 ^d	0.57 ^c	-0.58 ^c	-0.87 ^d					0.64 ^b
	10	Sx	0.74 ^b			0.83 ^d				0.71 ^b		
1.5 (sleep depr)	7	NF								-0.74 ^c		

^aA = anxiety scale

Es = ego strength

Lb = low back pain scale

Ca = caudality scale

Dy = dependency scale

Do = dominance scale

Re = responsibility

Pr = prejudice

St = social status

Cn = control

^bp < 0.05.

^cp < 0.1.

^dp < 0.01.

this test), the SC score positively correlated with the NF score beyond the 0.05 level. Sx total score correlated positively with three scales, as shown in table II.

IV. DISCUSSION.

The Pa scale score is significantly correlated with reactivity to LSD at three of the four doses studied and is significantly higher in the resistant groups at both low and high doses. In addition, the Pa scale has a higher correlation with performance on the NF test than does the dose of LSD given.

The interpretation of this finding requires some discussion. Normal subjects who score high on this scale are described as "readily becoming ego-involved in various activities and tending to make these pursuits personally relevant and important."⁷ The men were described as "energetic and industrious and as showing high initiative. In their expenditures of energy, however, these men were poised, rational, and clear-thinking. They were judged to be intelligent and insightful, with wide interests and progressive approaches."⁷ Low Pa scale scorers have been described as "mild, self-centered, and wary with narrow interests,"⁷ and as "underachievers and non-achievers."⁸ Thus, persons with high Pa scores within the normal range are not a little less paranoid than the criterion group from which the scale was derived (paranoiacs and paranoid schizophrenics); but, as Gough⁹ pointed out, "the correlates of Scale 6 (Pa) change markedly in character as the elevation shifts from moderate values to the higher ones." This phenomenon is encountered on other MMPI scales as well.

⁷Dahlstrom, W. G., and Welsh, G. S. An MMPI Handbook. p 196. University of Minnesota Press, Minneapolis, Minnesota. 1960.

⁸Anderson, W. The MMPI: Low Pa Scores. J. Counsel. Psychol. 3, 226-228 (1956).

⁹Gough, H. G. Tests of Personality: Questionnaires. A. MMPI. Contributions toward Medical Psychology. ed. A. Weider. Ronald Press Company, New York, New York. 1953.

Table III. T Tests

Dose	MMPI Scale ^a	Resistant, GT = 120	Sensitive, GT = 109	T value
		<i>Mean</i>		
		<i>N</i> = 25		
1.1 and 1.5	L	53.3	46.9	1.77 ^b
	F	49.2	52.8	-2.17 ^c
	K	62.3	50.6	3.63 ^d
	Hy	54.4	47.8	2.02 ^b
	Pa	51.9	43.6	3.54 ^d
	Si	43.2	51.9	-3.24 ^d
	A	41.6	48.7	-2.17 ^c
	Lb	53.2	44.7	1.84 ^b
	Ca	44.7	51.2	-2.50 ^c
	Dy	40.2	49.4	-3.25 ^d
	Do	58.1	51.5	2.60 ^c
	Re	54.4	47.9	1.73 ^b
	Pr	43.2	49.3	-1.87 ^b
	St	63.5	56.8	3.13 ^d
Cn	48.2	57.6	-2.55 ^c	
		<i>N</i> = 21		
1.8 and 2.0	Pd	51.2	56.8	2.17 ^{c(-)}
	Pa	52.2	46.8	2.24 ^c

^aSee footnotes at end of tables I and II.

^b $p < 0.1$.

^c $p < 0.05$.

^d $p < 0.01$.

In contrast to the Pa scale, which has a positive correlation with drug resistance, the Pr (prejudice) scale is significantly related to drug sensitivity at low doses. One might suspect that prejudice and paranoia would covary, but only 6 of the 550 MMPI questions appear on both scales, and 4 of these 6 are scored in opposite directions. High scores on the Pr scale indicate people who do things in a "somewhat injudicious and disgruntled manner, (are) given to impulsive and poorly controlled behavior, and (are) less intelligent and more ethnocentric than low scorers."¹⁰

The higher intelligence of resistant subjects as measured by the Army GT test at lower doses is consistent with the above findings and those of Paul, Langs, and Barr.⁵ If one considers intelligence an ego function, one might suspect that the Es scale would show similar findings, and it does at the 1.5 $\mu\text{g}/\text{kg}$ level.

Some further information can be applied to the role of ego function in drug resistance by examination of the K scale. Berger¹¹ found a strong relationship between high K score in the normal subject and the degree of self-acceptance. Gough, McKee, and Yandell¹² characterized high K normals as "enterprising, ingenious, resourceful, aggressive, clear-thinking, energetic, rational,

¹⁰Gough, H. G. Basic Readings on the MMPI in Psychology and Medicine. ed. Welsh and Dahlstrom. p 205. University of Minnesota Press, Minneapolis, Minnesota. 1956.

¹¹Berger, E. M. Relationships Among Acceptance of Self, Acceptance of Others, and MMPI Scores. J. Counsel. Psychol. 2, 279-183 (1955).

¹²Gough, H. G., McKee, M. G., and Yandell, R. J. Adjective Check List Analysis of a Number of Selected Psychometric and Assessment Variables. Officer Education Research Laboratory Technical Memorandum OERL-TM-55-10. May 1955.

versatile, and high in initiative." In the same study, low K subjects were rated as "awkward, cautious, peaceable, inhibited, retiring and shallow." Thus, the personality of the resistant subject at low doses as measured by the K scale is similar to that measured by the Pa scale.

In contrast to the criterion group from which the Hs scale was derived, high normal scorers are not found to be more hypochondriacal; rather, they are described as "sociable, enthusiastic, kind, grateful, versatile, courageous, and having wide interests."¹³ Similar findings were reported of high Hy (conversion hysteria) scorers by the same authors. Gough¹² found them to be "clever, enterprising, enthusiastic, imaginative, impatient, thankless, infantile, inhibited, both irresponsible and responsible, and spunky, and were impressed by the high degree of intellectual ability." Low Hy subjects were seen as "constricted, conventional, and controlled." In our study the K, Hs, and Hy scales are positively related to LSD resistance at the lower two doses, whereas they appear to be negatively related to drug resistance at the higher doses. (Hy was negatively related, but not at a statistically significant level.)

The findings of significant correlation between St (social status), Do (dominance), and Re (responsibility) and drug resistance at lower doses are consistent with the above. In addition, the negative correlation with Cn (control) agrees with the description of low Hy subjects.

Of particular interest is the finding of a negative correlation between drug resistance and the Ca (caudality) scale, which was derived to distinguish subjects with organic brain disease. Holden and Itil¹⁵ have reported recently that subjects who have undergone frontal lobotomies are extremely sensitive to the perceptual distortions caused by LSD.

Other scales that are significantly correlated with drug sensitivity at low doses can be seen as polar opposites of the personalities described as belonging to the drug resistant group; i.e., Dy (dependency), Si (social introversion), A (anxiety), and F (see below). High A scorers have been described as lacking in confidence in their abilities, inhibited, and over-controlled. As expected, high Si scale scorers are more withdrawn and inhibited. (This scale shows the same reversal of significance as do K, Hs, and Hy.) The F scale measures unusual or bizarre responses and can be seen as a measure of psychopathology. In addition, A, Ca, and Pr scale scores are significantly correlated with the symptom check list score.

A picture emerges of the subject who is resistant to LSD at low doses. He is more intelligent, energetic, and extroverted than the sensitive subject, who is less intelligent, constricted, over-controlled, more anxious, and dependent. At higher doses, the attributes defined by a high Pa scale score remain related to drug resistance, but those defined by high K, Hs, Hy, and low Si are either negatively related or not related to drug resistance.

If one looks at K, Hs, and Hy as scales showing a tendency toward the use of repression, an attractive hypothesis is that this defense mechanism is overcome at higher doses, leaving these subjects more sensitive than those who do not characteristically rely on this defense mechanism. The shy, inhibited person (as measured by high Si) who admits to some unusual thoughts (as measured by F) and anxiety (as measured by A) is more sensitive at the lower doses, but his customary styles of defense may give him some relative resistance at the higher doses. The fact that the Pa scale remains related to resistance at higher doses indicates that perhaps other ego mechanisms are still operating toward drug resistance.

¹³Dahlstrom and Welsh. (*Op. cit.*), p 165.

¹⁴*Ibid.* p. 182.

¹⁵Holden, J. M., and Itil, T. M. Roche Report-Frontiers of Psychiatry. Vol 1, No. 3. 1971.

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