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Hypnotic Induction of the Interference of Psilocybin with Optically Induced Spatial Distortion

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Among the most recently discovered properties of psychodysleptic drugs, specifically psilocybin, is their interference with readaptation to optically induced distortions *(Hill, Fischer,* and *Warshay,* 1968). This interference, that is, the lowering of the spatial distortion threshold, can be measured with a phorometer and expressed in prism diopters – as loss of compensation (see Fig. 1). It was also recently shown that not only the determination of spatial distortion thresholds, but also perceptual performance in general are significantly related to drug-induced behavioral change as measured by the Minnesota Multiphasic Personality Inventory (MMPI) *(Fischer, Marks, Hill* and *Rockey,* 1968). Moreover, subjects with a small perceptual retest variance without any drug were found to retain their normal and stable MMPI profiles during a subsequent drug experience, whereas subjects with a large perceptual retest variance responded to the drug with increased psychopathology *(Fischer* and *Warshay,* 1968). These latter were termed *high* psilocybin reactors while the former, *low* psilocybin reactors. With two representatives from each category, we investigated the influence of personality structure on the stability of perceptual performance, specifically the degree of reproducibility under hypnotic induction of the psilocybin-induced change in spatial distortion thresholds. We hypothesized that stable or variable perceptual performance is but another expression of a stable or variable personality pattern. If so, stability or variability will manifest themselves not only without any drug, or during the drug-induced experience, but also during the hypnotically induced drug experience.

Method

A standard hypnotic induction procedure *(Wolberg,* 1965) was used during the individual training (consisting of three to five sessions) of the four subjects until each subject felt himself as part of a tranquil scene. Three subjects had no difficulty visualizing themselves relaxing on a beach with the tide coming in, but the fourth preferred a scene

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– from a Swiss vacation – with the sea being replaced by a stream. Initially it was hoped to use a taped standard induction; however, one subject, a high drug reactor, needed to relax at his own pace and was unable to follow the tape. The other high drug reactor turned out to be an instant somnambulist for whom a lengthy induction was unnecessary. Therefore, the taped standard induction was discarded in favour of a live performance.

Spatial distortion thresholds, base down as well as base up *(Hill, Fischer* and *Warshay,* 1968), were measured with the phorometer under four conditions: (1) during the psilocybin-induced experience, i.e., at 0 time, 60–110 minutes after the oral administration of 160–200 μg/kg of psilocybin (peak time) and 280 minutes after the administration of the drug (post control), (2) under hypnotic induction of the drug state, (3) under hypnotic induction of the drug state after the administration of a psilocybin placebo tablet and, (4) under hypnotic induction of the drug state after the administration of a reduced dose of psilocybin and one-half tablet placebo.

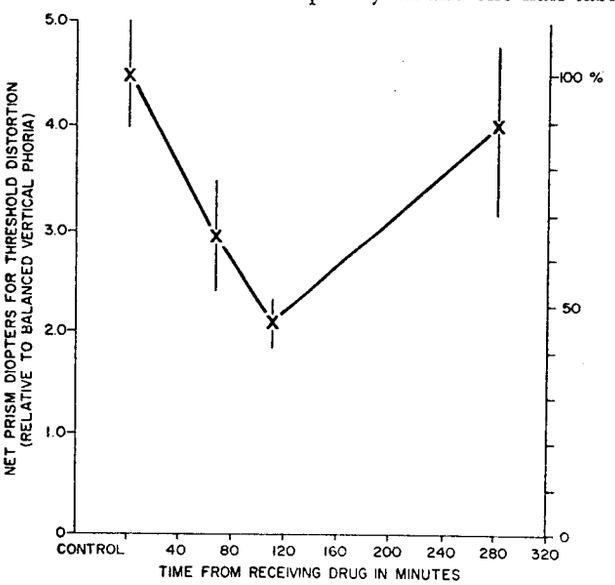

Fig. 1 Prism lens induced distortion of spatial thresholds – base up – prior to and during a drug experience elicited by 160 μg/kg psilocybin in a representative, male student volunteer. The standard deviation is indicated by vertical lines going through points, each of which is a mean of six observations. The loss of compensation for optically induced distortions is greatest at the peak of the drug experience, i. e., 90–110 minutes after the oral administration of the drug.

The optical aberration produced by the phorometer induces a distortion of visual space through counter-rotating, i.e., a Risley-prism unit. It is the increasing power of this system which progressively curves the contours of objects viewed parallel and near to the prism base.

In the second, third and fourth procedures the subject was induced and placed in his scene with the expectation that he would experience a psilocybin reaction. It was emphasized to him that while the experience might be profound, unpleasant vegetative side-effects would be minimal or absent, and he was then left resting comfortably on a couch in the semi-darkened room. Before being wakened for testing it was suggested to the subject that his experience would continue and be most vivid during testing, following which it would abate normally.

There was a lapse of six months to a year between the last psilocybin experience (procedure number 1) and the other procedures which followed at weekly intervals.

Procedure 4 could be undertaken with only two subjects, one high and one low psilocybin reactor, since the other two subjects moved from the area and were thus unavailable for experimentation.

Results

Fig. 2 displays the perceptual performance of a low (stable) drug reactor (Fig. 2 a) and of a *high* (variable) reactor (Fig. 2 b). It is apparent from Fig. 2 a that S. H., our

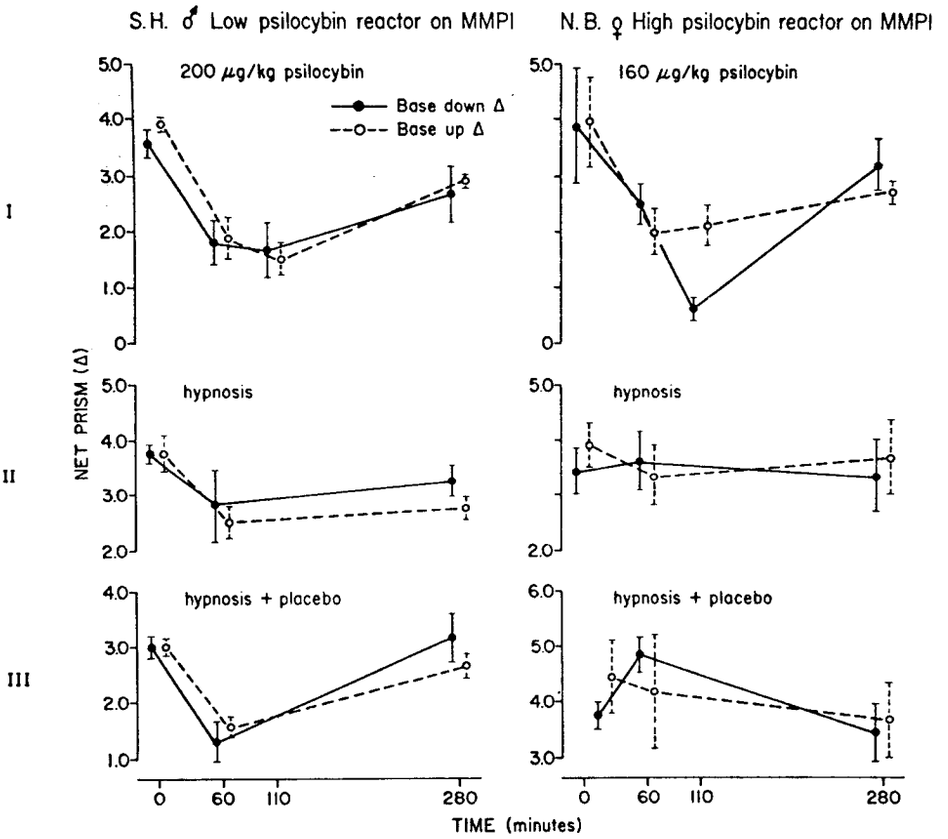

Fig. 2a Fig. 2b

Fig. 2 Display of spatial distortion thresholds of a *low* (stable) drug reactor and of a *high* (variable) drug reactor.

Fig. 2a spatial distortion thresholds of S. H., a *low* reactor, i. e., a stable, psilocybin reactor, a self-selected college-age male volunter (I) at 0 time; at peak time, i. e., 60–110 minutes after the oral administration of 200 µg/kg of psilocybin; and at termination, i. e., 280 minutes after the administration of the drug; (II) under hypnotic induction of the drug state; and (III) after the administration of a psilocybin placebo *and* hypnotic induction of the drug state.

Fig. 2b spatial distortion thresholds obtained under the same conditions except for the dose of psilocybin which is 160 µg/kg for N. B., a *high*, i. e., variable, psilocybin reactor, a self-selected, college-age female volunteer.

low psilocybin reactor (whose stable MMPI profiles before T_1, during drug peak T_2 and after the psilocybin experience T_3 can be seen in Fig. 3 a) displays, after the administration of a psilocybin placebo *and* while under hypnotic induction of the peak of a

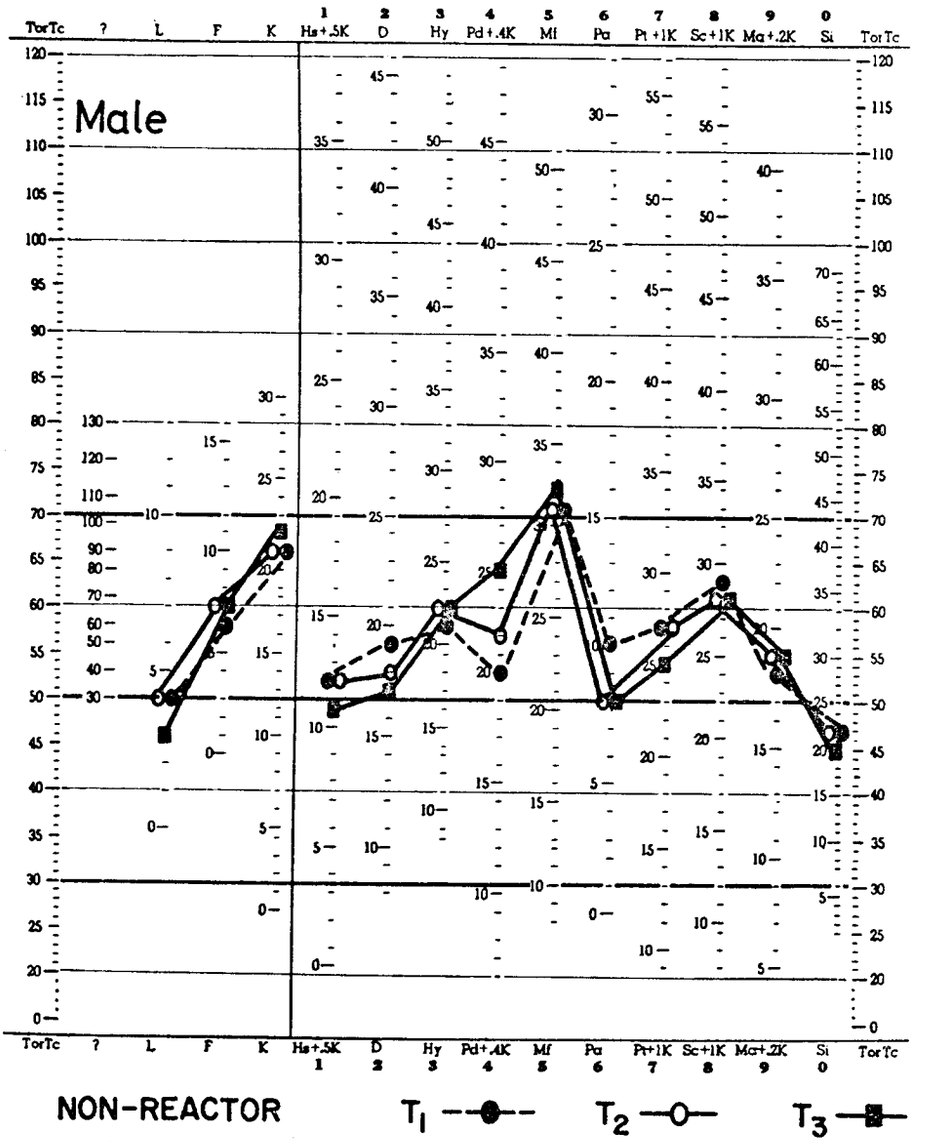

Fig. 3a

Fig. 3 MMP profiles of the two subjects of Figure 2 prior to (T_1), during (T_2) and after (T_3) the administration of psilocybin.

Fig. 3a MMPI profiles of S. H., the *low*, (stable) psilocybin reactor (from Figure 2a) before, during and after the oral administration of 200 µg/kg psilocybin.

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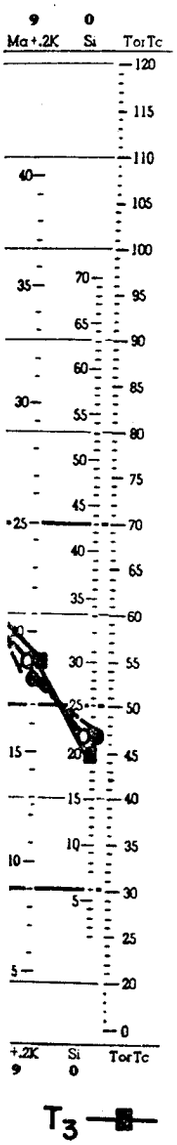

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psilocybin experience (Fig. 2 a-III), a loss of compensation, i.e., a lowering of his spatial distortion threshold, nearly identical to that induced a year before by 200 μ/kg psilocybin. Hypnotic induction of the drug state by itself (Fig. 2 a-II) results in a loss of

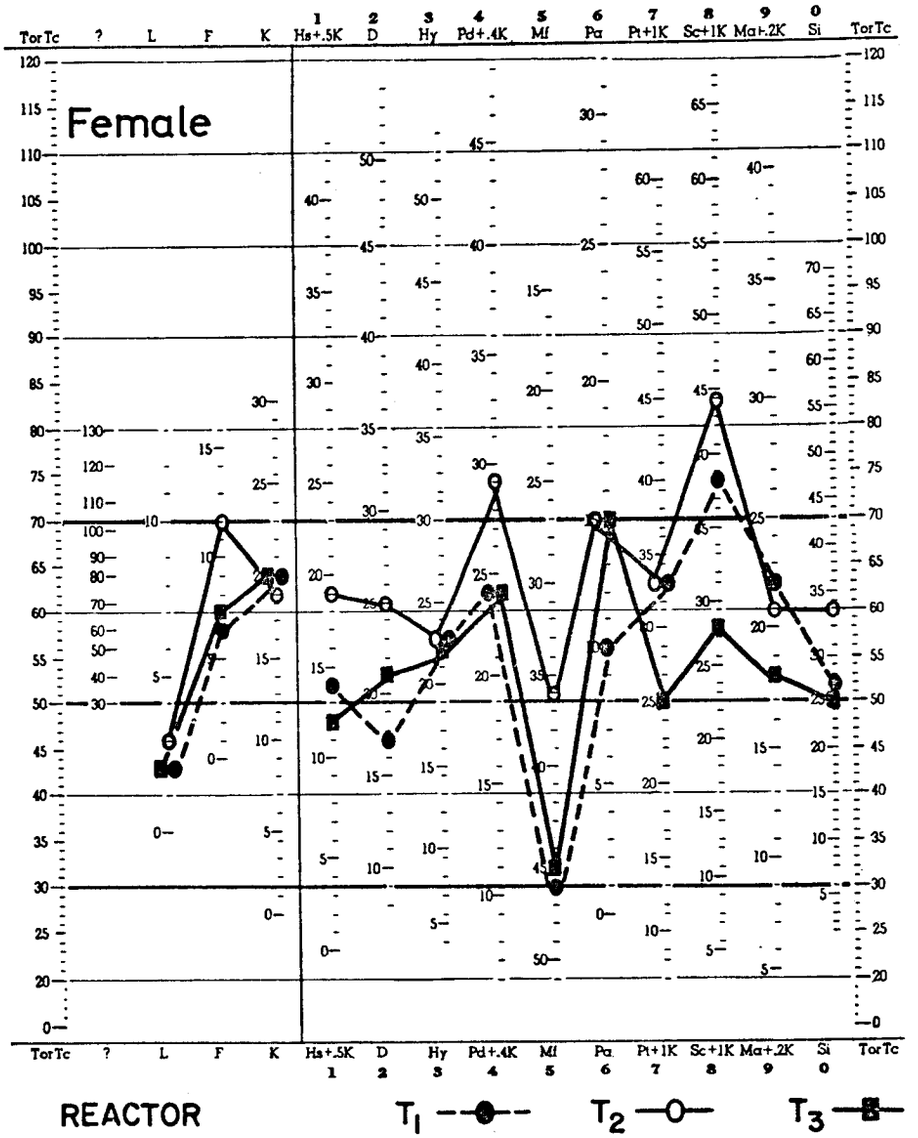

Fig. 3b

Fig. 3b MMPI profiles of N. B., the *high*, variable psilocybin reactor (from Figure 2b) before, during and after the oral administration of 160 μg/kg psilocybin.

compensation of only about one-half as much. Note also the close correspondence of the size of the standard deviations for the spatial distortion thresholds during the course of the experiments illustrated in Fig. 2 a–I and III.

In contrast to the data obtained on S. H., it is evident from Fig. 2 b that N. B., our high psilocybin reactor (whoes variable MMPI profiles in Fig. 3 b are evidence of her psychotic reaction at T_2) after the administration of a psilocybin placebo *and* while under the hypnotic induction of the peak of a psilocybin experience (Fig. 2 b-III) produces an extremely variable perceptual performance with large standard deviations as compared to her performance induced by 160 μg/kg psilocybin about six months previously. We attribute her less variable performance while under hypnotic induction of the drug state only (Fig. 2 b-II) to the absence of the placebo tablet.

Fig. 4 once again illustrates the perceptual performance of another contrasting pair of subjects, a *low*-psilocybin reactor, T. K., (whose stable MMPI profiles at T_1, T_2 and T_3 can be seen in Fig. 5 a) and a high psilocybin reactor, D. D., (whose variable MMPI profiles can be inspected in Fig. 5 b). Half of T. K.'s loss of compensation, i.e., a lowering of his spatial distortion threshold at the peak of a 200 μg/kg psilocybin experience a year before (Fig. 4 a-I), is reproduced by the hypnotic suggestion of the drug experience (Fig. 4 a-II).

In procedure III, when hypnotic induction of the drug experience was combined with the administration of a psilocybin placebo (Fig. 4 a-III), T. K. – who during the past year served repeatedly as a volunteer for psilocybin experimentation – realized twenty minutes after the "drug" administration, despite hypnotic suggestion, that since the expected vegetative effects were absent, he must have obtained a placebo. In view of this, Fig. 4 a-III illustrates the partially learned reaction of a stable psilocybin reactor to the repeated application of a hypnotically induced drug experience.

In procedure IV, T. K., was hoodwinked by a combination of a low (approximately one-fourth) psilocybin dose and half tablet placebo administered in such a way that he was convinced during the whole experience that he was given 200 μg/kg of the drug. Fig. 4 a-IV illustrates that the elaborate procedure IV for our stable subjects results in a loss of compensation to optically induced distortions equivalent to that obtained in procedure II, i.e., hypnotic induction of the drug experience alone. Note the small standard deviations of T. K. in all phases of the four procedures.

In contrast to the stable performance of T. K. during the four procedures, D. D., the *high* (variable) psilocybin reactor (whose MMPI profiles during T_1, T_2 and T_3 can be seen in Fig. 5 b) displays large standard deviations during the determination of his spatial distortion thresholds before, during and after the psilocybin experience (Fig. 4 b-I). Under hypnotic induction he is unable to duplicate his previous perceptual performance under psilocybin (Fig. 4 b–II), and only under hypnotic induction *and* a psilocybin placebo (Fig. 4 b-III) as well as during procedure IV, consisting of the combination of hypnotic induction, one-third of his first psilocybin dose, and one-half tablet placebo, is he able to perform as well as the stable subject T. K. under hypnotic induction solely (Fig. 4 a-II).

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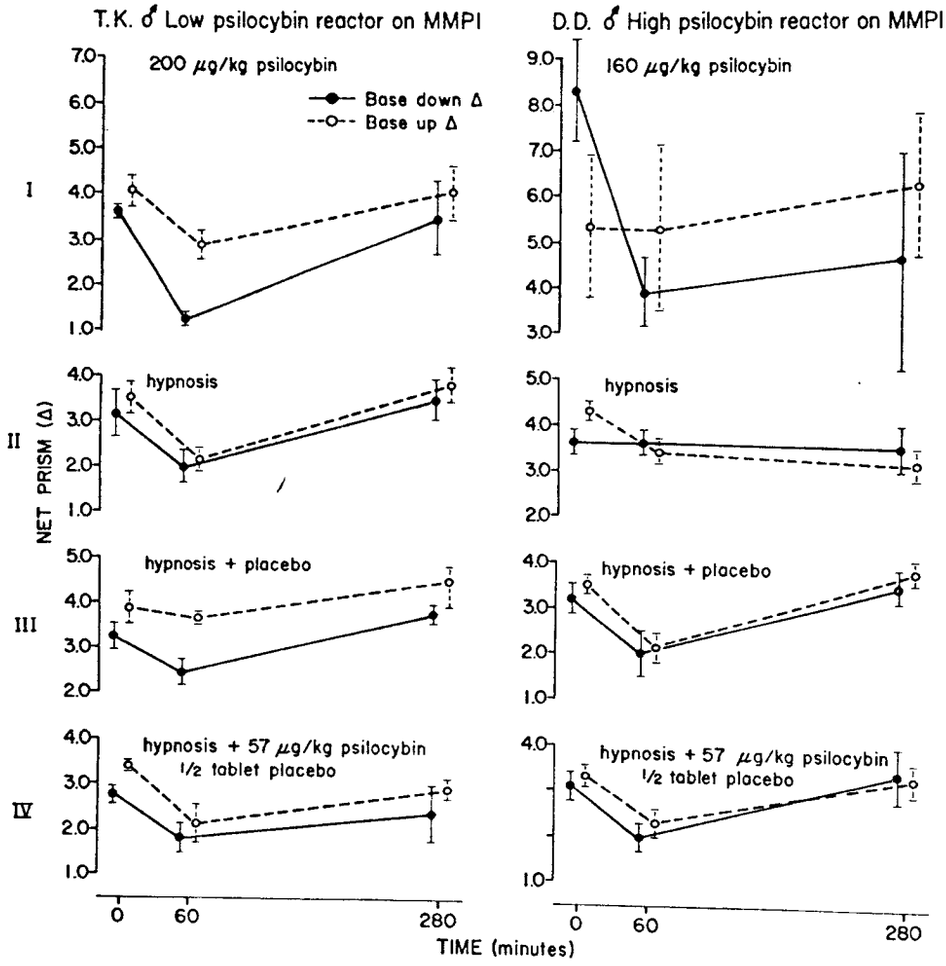


Fig. 4a Fig. 4b

Fig. 4 Display of spatial distortion thresholds of a *low* (stable) drug reactor and of a *high* (variable) drug reactor.

Fig. 4a spatial distortion thresholds of T. K., a *low* reactor, i. e., a stable psilocybin reactor, a self-selected college-age male volunteer (I) at 0 time, at peak time, i. e., 60–110 minutes after the oral administration of 200 μg/kg of psilocybin and at termination, i. e., 280 minutes after the administration of the drug; (II) under hypnotic induction of the drug state; (III) after the administration of a psilocybin placebo *and* hypnotic induction of the drug state; and (IV) under hypnotic induction of the drug state after the administration of a reduced dose of psilocybin and one-half tablet placebo.

Fig. 4b spatial distortion thresholds obtained under the same conditions except for the dose of psilocybin which is 160 μg/kg for D. D., a *high,* i. e., variable psilocybin reactor, a self-selected, college-age male volunteer.

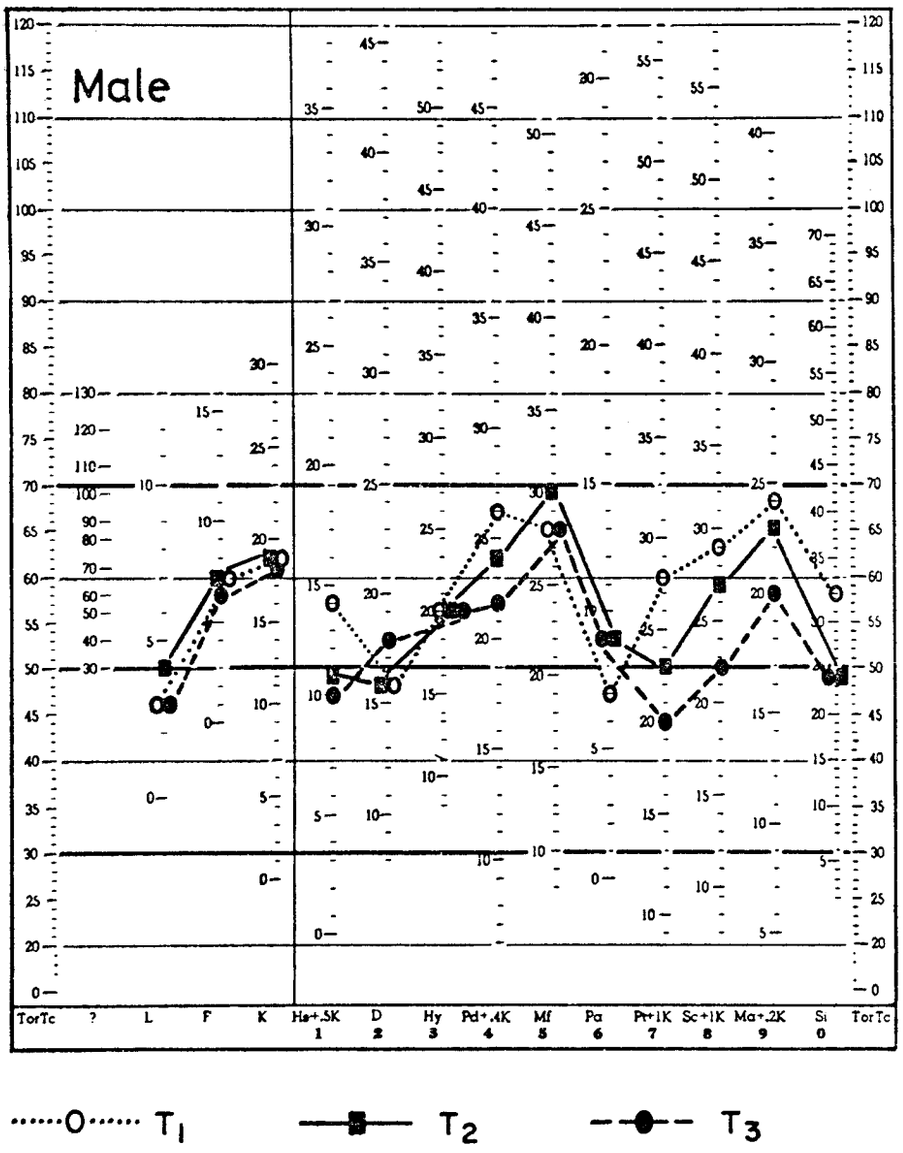
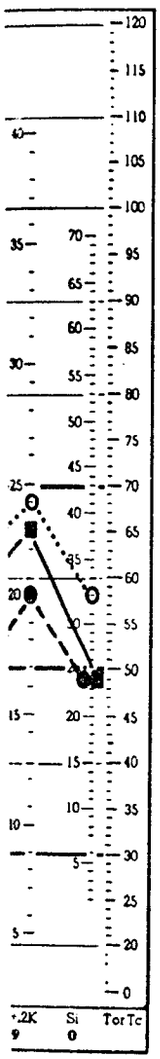


Fig. 5a

Fig. 5 MMPI profiles of the two subjects of Figure 4 prior to (T_1) during (T_2) and after (T_3) the administration of psilocybin.

Fig. 5a MMPI profiles of T. K., the *low* (stable) psilocybin reactor (from Figure 4a) before, during and after the oral administration of 200 µg/kg psilocybin.



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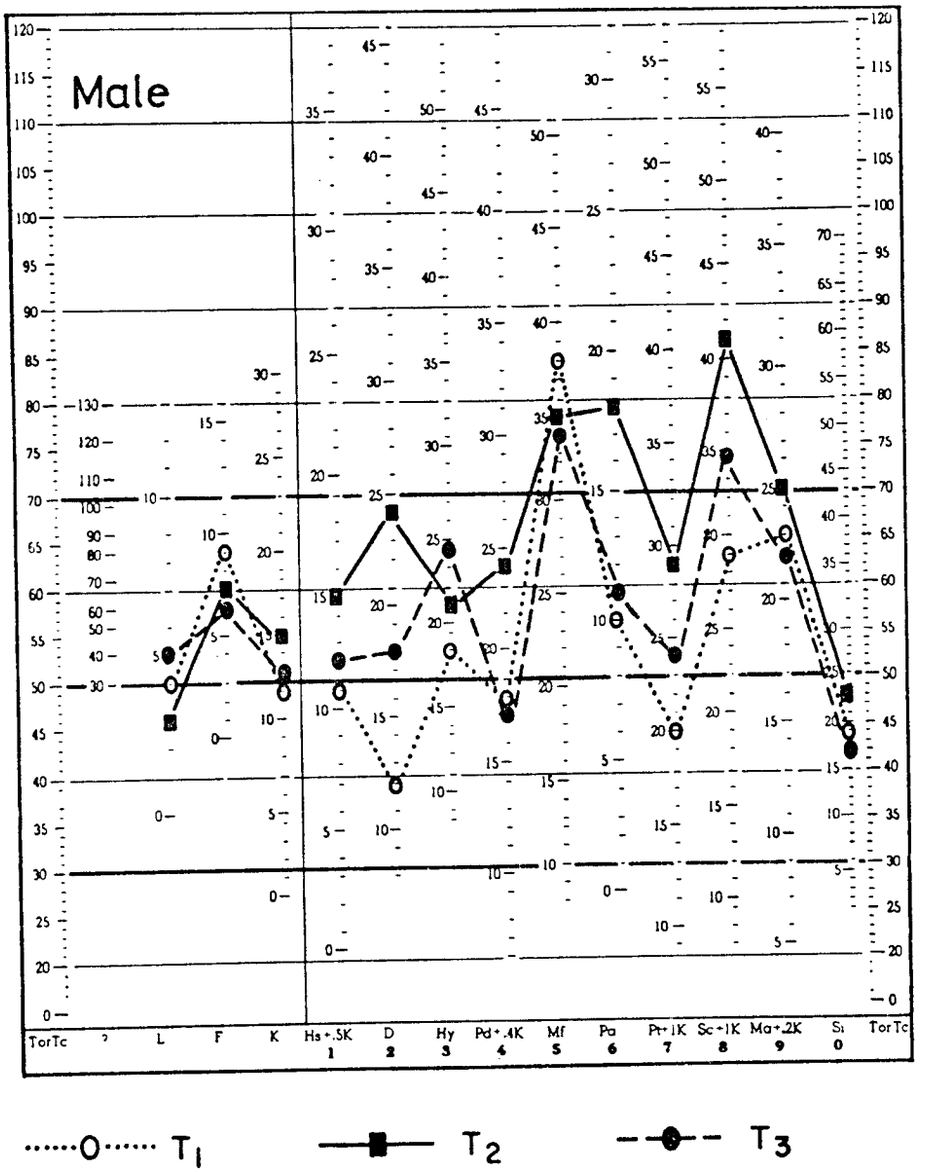

Fig. 5b

Fig. 5b MMPI profiles of D. D., the *high* (variable) psilocybin reactor (from Figure 4b) before, during and after the administration af 160 μg/kg.

Discussion

The spatial distortion threshold measurements, then, seem to bear out the assumption that stable or variable perceptual performance, as displayed by the two pairs of low and high psilocybin reactors in Fig. 2 and 4, is but another expression of a stable or variable (MMPI) personality profile (see Fig. 3 and 5). Evidently, "stability" or "variability" are characteristic personality invariants observable not only without any drug but also during a psilocybin-induced experience, and even during a hypnotically induced psychodysleptic drug experience. Although our experiments have been performed with psilocybin only, we have good reasons for including the other two psychodysleptic drugs, LSD and mescaline, into our generalization: (1) demonstrated cross-tolerance between psilocybin, LSD and mescaline *(Isbell, Wolbach, Wikler,* and *Miner,* 1961, and *Wolbach, Isbell,* and *Miner,* 1962) and (2) our own findings of an increase in the frequency of saccades on the physiological nystagmus, specifically the characteristic square-wave pattern of these saccades which are produced only by these three drugs *(Hebbard* and *Fischer,* 1966).

The results are in agreement with previous findings that the extent of variability on simple perceptual tasks without any drug – e.g., the taste threshold retest variance or the magnitude of the standard deviation of spatial distortion thresholds – is significantly related to the extent of drug induced behavioral change *(Fischer* and *Warshay,* 1968). Subjects with small retest variance on a perceptual task can be expected to respond with lower levels of arousal and smaller increase in MMPI reactivity scores during psychodysleptic drug exposure, whereas the converse is true for subjects with a large retest variance on perceptual tasks *(Fischer, Marks, Hill* and *Rockey,* 1968). Therefore, based on the size of the standard deviation on a perceptual task, an individual's behavioral drug reactivity can be reliably predicted if the subject represents either of the two extremes of reactivity.

Although our sample includes subjects of both high and low susceptibility to hypnotic induction, we could find *no* relation between a subject's ability to replicate as exactly as possible a perceptual task under drug experience, and his susceptibility to hypnotic induction. As a matter of fact, S. H., the low (stable) reactor, needed the longest individual training before he could be hypnotically induced, while N. B., a high (variable) reactor happened to be an instant somnambulist; however, hypnotic induction could easily be applied to T. K., the low (stable) reactor, whereas D. D., the high (variable) reactor would not accept a tape-recorded hypnotic induction and had always been difficult to induce. The absence of a relationship between susceptibility to hypnotic induction and the ability to replicate the hypnotically induced perceptual task becomes important when it is realized that these two variables have not yet been clearly separated in the literature *(Sjoberg* and *Hollister,* 1965, *London, Hart* and *Leibovitz,* 1968, and *Duke,* 1968).

Little is known about the underlying mechanism(s) which lead to the psilocybin-induced lowering of spatial distortion thresholds, i.e., the reversible interference with readaptation to prism-induced distortions of visual space. It is reasonable to assume, however, that the interference which can also be hypnotically induced is functionally

related to a general breakdown of learned size constancies, a breakdown which accompanies the gradual loss of ego control, i.e., the drug-induced departure into the sensory-mental dimension at the expense of physical space-time.

There is a conception which regards hypnosis "not as a special peculiar thing as often seems to be implied, but as a normal personality process, special only in the sense that it represents an unusual combination of situational, personal, and interpersonal factors which separately or in other configurations are also present in other experiences and behaviors" *(Ås,* 1963). Our results and our conclusion that the degree of stability of perceptual performance is a personality invariant are consistent with the above concept.

Acknowledgements

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We should like to thank Dr. *Philip Marks* for his expert advice and assistance in the use of the MMPI and express our sincere appreciation to our devoted volunteer subjects.

Summary

The influence of personality structure on the stability of perceptual performance, specifically the degree of reproducibility under hypnotic induction of the psilocybinproduced lowering of spatial distortion thresholds, was investigated in two "variable" and two "stable" psilocybin reactors, that is, subjects who displayed variable and stable MMPI profiles under both control conditions and the influence of 160–200 µg/kg psilocybin. The results indicate that degree of stability in perceptual performance is a personality invariant with or without drug and also during the hypnotically-induced psilocybin experience. Moreover, susceptibility to hypnotic induction and ability to replicate exactly the hypnotically induced perceptual task are unrelated.

Zusammenfassung

Der Einfluß der Persönlichkeitsstruktur auf die Stabilität der Wahrnehmungsleistung – im besonderen die hypnotisch-induzierte Reproduzierbarkeit der durch Psilocybin hervorgerufenen Erniedrigung des Raum-Verbiegungsschwellenwertes – wurde bei variablen und stabilen Vpn., d. h. bei solchen, die ohne Droge oder aber auch unter Psilocybineinwirkung variable und stabile Minnesota Multiphasic Personality Inventory (MMPI)-Profile aufweisen, untersucht.

Die Resultate zeigen, daß die Stabilität der Wahrnehmungsleistung unter allen Bedingungen, d. h. unter Drogeneinwirkung, ohne Droge sowie auch während des hypnotisch induzierten Drogen-Experimentes, durch die Persönlichkeitsstruktur bedingt ist.

Hypnotisierbarkeit und die Fähigkeit unter Hypnose einen Wahrnehmungstest exakt durchzuführen, sind zwei voneinander unabhängige Phänomene.

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A Relationship between Brain Serotonin and Adrenocortical Secretion and its Possible Significance in Endogenous Depression*

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Introduction

General

This essay concerns research which in part was on endogenously depressed patients and in part was on rats treated so that their biochemical state had similarities to that reported for depressed human subjects. The work was undertaken with the aim of improved understanding of the relationships between biochemical changes in depression and of the relationships of these changes to symptoms and to potential therapies. It is reasonable that endogenously depressed patients should be studied biochemically as their marked physical symptoms suggest biochemical disturbances and the similarity of these symptoms in different subjects suggests that the disturbances may also be similar. While it is conceivable that the physical symptoms are wholly or partially secondary to the psychological manifestations of the disease, the following reasons are sufficient to justify attention being paid to biochemical abnormalities.

1. In some patients somatic symptoms dominate the pathological picture, depression of mood having receded to a minor role.

2. Marked positive correlations exist between responsiveness to drugs or physical treatments such as electroconvulsive therapy *(Carney, Roth* and *Garside,* 1965; *Mendels,* 1965) and classification as being endogenously depressed, whereas neurotic or exogenous depressions are relatively unresponsive to these treatments.

This suggests that somatic symptoms or biochemical abnormalities play a larger part in the endogenous than in the exogenous illness.

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