

Right Hemisphere Involvement in Mescaline-Induced Psychosis

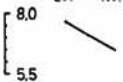
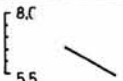
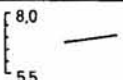
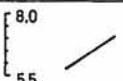
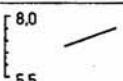
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In a pilot study involving six male healthy volunteers (mean age = 37.5), ingestion of 0.5 mg mescaline sulphate led to a florid psychedelic experience and striking changes in hemispheric dynamic balance. The nature and intensity of this artificial psychosis was assessed throughout the experiment using the Brief Psychiatric Rating Scale (BPRS) at ½ hour, 1½ hours, 3½ hours, and 7 hours after drug intake. After each such psychiatric assessment, subjects were required to perform a visual half-field task on a three-channel tachistoscope: a face/nonface decision task with known right hemisphere affinity. Exposure time was 60 ms. The subjects had to press a lever ipsilateral to the target stimulus with their index fingers as fast as possible. The run consisted of 36 cards: 12 targets in the left visual field (LVF), 12 in the right visual field (RVF), and 12 bilateral nontargets (for details, see Oepen et al., 1987). At the peak of the schizophreniform psychosis, brain metabolism for each subject was investigated using 99m-Tc-HMPAO SPECT with a rotating gamma camera. The brain "maps" produced were then compared with earlier maps produced under control conditions before the subject's participation in the task.

During psychosis, a pattern of LVF/RVF asymmetry for the described face task markedly contrasted with that seen under control conditions. With repeated testing, right hemisphere performance in the LVF deteriorated steadily as psychopathology (as measured by the BPRS) increased. At the same time, left hemisphere performance in the RVF improved to a level even exceeding that seen before drug intake (see Fig. 1). That is to say, mescaline psychosis seemed to lead to a reversal of normal hemifield asymmetry for the right-hemisphere-specific task. SPECT analysis showed clear relationships between mescaline ingestion and a variety of asymmetric, regionally specific increases in the marker substance uptake. Statistically significant increases were found in the striato-limbic regions of the right hemisphere ($p = 0.036$, MANOVA) when compared with levels in the same subject under control conditions. Our combined results point to a covariation of heightened striato-limbic metabolic activity in the right hemisphere with deterioration of right hemisphere performance on the face test during mescaline-induced psychosis. Given that neuronal activity, regional cerebral metabolism, and rCBF are strongly correlated (Sokoloff, 1981), we feel justified in interpreting our SPECT results as evidence that mescaline operates selectively on the brain, increasing neuronal activity especially in the striato-limbic system of the right hemisphere.

The above-described neuropsychological findings in mescaline-intoxicated subjects closely parallel results of extensive earlier tachistoscopic testing with acute

Fig. 1. Effect of mescaline in normal controls

	FT		BPRS	SPECT
TRIALS	mean freq. correct			
	LVF	RVF		
t ₀			$\bar{X} = 19.50$ $Sx = 1.52$	$\emptyset$
t ₁ 40 - 60min			$\bar{X} = 26.33$ $Sx = 6.71$	$\emptyset$
t ₂ 95 - 115 min			$\bar{X} = 33.00$ $Sx = 10.32$	$\emptyset$
t ₃ 225 - 245 min			$\bar{X} = 36.50$ $Sx = 10.27$	sign. rCBF - increase in basal ganglia of the RH (p = .036)
t ₄ 430 - 450 min			$\bar{X} = 30.17$ $Sx = 4.22$	$\emptyset$

Changes of tachistoscopic hemifield advantage, Brief Psychiatric Rating Scale (BPRS) and SPECT are shown for baseline and time intervals T1-T4. Right hemisphere, left visual field (LVF) performance of correct face recognition deteriorates steadily with increasing psychopathological features (assessed by BPRS) while LVF performance goes up (simultaneous left hemisphere release). After the peak of the psychosis at T3, revealing significant alterations of right hemisphere blood flow using SPECT, these changes begin to reverse at T4 and return to the pattern seen at baseline (T1).

schizophrenics (Oepen et al., 1987; cf. Oepen et al., 1988). We have consequently concluded that the mescaline-induced psychedelic experience, in addition to being indistinguishable from acute schizophrenia (Hermle et al., 1988), also has essential neurobiological features in common with schizophrenia, which (like mescaline-induced psychosis) seems to be causally associated with primary right hemisphere striato-limbic hyperactivity (with left hemisphere dysfunction and later neurophysiological alterations appearing as secondary, dependent phenomena).

References

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