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Randrup A & Munkvad I. Stereotyped activities produced by amphetamine in several animal species and man. *Psychopharmacologia* 11:300-10, 1967.
[Department E, St. Hans Hospital, Roskilde, Denmark]

Amphetamine in doses of 1-20 mg/kg produces stereotyped activities in chickens, pigeons, mice, rats, guinea pigs, cats, dogs, squirrel monkeys, and chimpanzees. In man, similar doses of amphetamine can produce a psychosis with all the known symptoms of schizophrenia, including stereotypy. [The *SCI*® and *SSCI*® indicate that this paper has been cited in over 445 publications.]

Stereotyped Behavior, Amphetamine, and Psychosis

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At St. Hans Hospital, Denmark, there is a long tradition for studying the biological aspects of psychiatry. This tradition was revitalized in the 1950s by Dr. I. Munkvad, who hired me as a biochemist in 1959. The studies on amphetamine were inspired by evidence, which was then new, about adrenergic mechanisms in the brain and about amphetamine abuse and psychosis.

We had decided to look for abnormal behaviors, which might be elicited in animals by amphetamine, and I remember that already in the first trial I noticed the continuous and stereotyped character of the behavior of the amphetamine-treated animals compared to the controls. I also remember that, at a very early stage, I reflected that, if amphetamine would elicit in me a similar intense, stereotyped behavior, my mind would hardly be unaffected.

The stereotyped behavior proved to be a highly reproducible phenomenon, which became employed by many research workers who were interested in biochemical problems (including brain mechanisms) or behavioral problems related to psychiatry. The biochemical studies quickly led to what is now known as "the dopamine hypotheses" in psychiatry.[1-3] The behavioral studies have shown that the stereotyped behavior is a much more complex phenomenon than was first realized and that it is related to another outstanding feature of psychosis: disintegrated behavior and psychic function.[3,4]

In recent years our studies of stereotyped behavior have been expanded by the application of a systems approach[5] and an ethologic approach.[3] Both of these approaches have proved useful for the study of complex neurochemical-behavioral-environmental interactions.[3] But in my opinion it is even more important that these methods and their underlying theories have helped to improve our conception of a stereotyping psychotic patient or drug addict both as a (dys)functioning biological structure and at the same time as a fellow human being.[6]

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2. **Bowers M B.** Plasma monoamine metabolites in psychotic disorders. *Arch. Gen. Psychiat.* 45:595-6, 1988.
3. **Randrup A, Sørensen G & Kobayashi M.** Stereotyped behaviour in animals induced by stimulant drugs or by a restricted cage environment. *Jpn. J. Psychopharmacol.* 8:313-27, 1988.
4. **Lyon N, Mejsholm B & Lyon M.** Stereotyped responding by schizophrenic outpatients. *J. Psychiat. Res.* 20:137-50, 1986. (Cited 5 times.)
5. **Marchais P & Randrup A.** Nouvelle approche bioclinique en psychiatrie. Stéréotypies, désorganisations comportementales et psychiques, et amphétamines (A new biochemical approach in psychiatry. Stereotypies, behavioral and psychic disorganization, and amphetamines). *Ann. Medico-Psychol.* 141:758-70, 1983.
6. **Sørensen G & Randrup A.** Abnormal behaviour of bank voles reduced by an enriched cage milieu. Perspectives for the problem of humane attitudes in biological psychiatry. *Ethology Sociobiol.* 10:414-5, 1989.