

108 (1568)

**Observations on the physiology of the otic labyrinth. The influence of prolonged rotation on the duration of post-rotatory nystagmus.**

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Rotation of the head in space is accompanied by ocular movements of a definite type. These ocular movements (nystagmus) present two phases: a slow deviation of the eyes opposite to the direction of rotation, followed by a quick return to the initial position.

On cessation of rotation similar movements are observed. In the post-rotatory nystagmus, however, the slow deviation phase is in the direction of the preceding rotation.

The deviation phase as shown by Wilson and Pike<sup>1</sup> is dependent on labyrinthine stimulation whereas the quick return is due to a proprioceptor reflex arising from the stretched antagonist ocular muscle during the deviation phase. These ocular movements can be especially well studied in the post-rotatory period.

The duration of the post rotatory nystagmus is dependent on the intensity of the labyrinthine stimulus and therefore on the speed of rotation and up to a certain point on the number of revolutions at any given speed. Using a standard of ten turns in twenty seconds, the duration of post rotatory nystagmus in man has been utilized as an index of labyrinthine efficiency.

This test has been applied extensively in the examination of candidates for the U. S. Aviation Service.

The post rotatory nystagmus under the standard rotation test has an average duration of 23 seconds. This figure is based on a large number of determinations made by investigators in the otological department of the Air Service.<sup>2</sup> On the other hand, according to members of the psychological department of this Service<sup>2</sup>

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<sup>1</sup> Wilson and Pike, *Philosophical Transactions of the Royal Society*, London, 1912, Series B, CCIII, 127.

<sup>2</sup> Manual of the Medical Research Laboratory, War Department, Air Service, Division of Military Aeronautics, Washington, D. C.

the nystagmus time decreases progressively with practice. They find that in four persons subjected to frequent periods of rotation over an extended period (20 days) the average post-rotatory nystagmus time fell from 24.9 to 6.3 seconds.

The question then arises as to whether the nystagmus time can be taken as an absolute index of labyrinthine efficiency.

In experiments on animals it has been shown that the nystagmus following unilateral extirpation of the otic labyrinth disappears a few days after operation and that the ocular symptoms (deviation) recur after ablation of the cerebrum. This seems to indicate that the disappearance of nystagmus under these circumstances is dependent on the activity of a compensatory mechanism localized in the cerebrum.<sup>1</sup>

In order to decide whether such compensation occurs after repeated rotation I have tested the matter as follows: Cats were subjected to interrupted horizontal rotation over a prolonged period and the nystagmus time observed. The rotation tests (20 turns in 20 seconds) were applied 50 to 60 times daily at intervals of two minutes and were repeated for twenty consecutive days.

The duration of post-rotatory nystagmus under these conditions was found to vary slightly in different animals. With 20 revolutions in 20 seconds the maximal variations in the post-rotatory nystagmus time observed in six animals were from 12 to 19 seconds.

The ocular responses to rotation for each animal remained fixed within narrow limits and were unaffected by prolonged rotation. It may be concluded therefore that rotation tests give an adequate index of labyrinthine activity.

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<sup>1</sup> Prince, A. L., PROCEEDINGS OF THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE, 1917, XIV, 133.