

EFFECTS OF RODENTIZED *MOZART*'S MUSIC AND TREADMILL EXERCISE ON THE COGNITIVE BEHAVIOR IN AN *IN VIVO* RAT MODEL

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By 2050, 40% of the population will probably be over 60 years, so neurodegenerative diseases typical for old age will be more prevalent. Beyond known risk factors (pesticides, trauma) other stressors, intensified by modern lifestyle, may play there an additive or synergistic role. Systemic responses to distress include altered cognitive behavior which is also the earliest indicator of slowly developing neurodegeneration. Regular physical activity was shown to decrease incidence of ROS-associated neurodegenerative diseases. As mechanism, adaptation induced by oxidative stress can be assumed. In our experiment the effect of rhythmic music and exercise on the cognitive behavior was investigated.

Sixty rats, in 5 groups of 12, were used in the 10-week experiment where their cognitive behavior (spatial memory performance, spontaneous exploration, psychomotor, rota-rod activity as well as sensorimotor gating) was investigated. The "music" group listened to *Mozart*'s piano sonata in D major (K 448) transposed higher by two octaves (rodentized sonata) at 60 dB loudness, once daily for 80 minutes, while the positive control group was exposed to white noise of identical parameters. The „trained” animals performed treadmill exercise, once daily for 12 minutes, and the fourth ("trained music") group received rodentized musical stimuli plus treadmill exercise as above. Negative controls received neither music nor treadmill. Body weight was measured daily. On the 10th week, acoustic startle response and pre-pulse inhibition as well as co-ordination performance of the rats was recorded individually. At the end of that week, peripheral blood was taken to measure corticosterone and glucose. Weight of brain and adrenals was measured during dissection.

Performance of rats in the "music" group was significantly improved vs. both controls in short- and long-term and long-lasting working memory and recall. Treadmill exercise alone had no effect, but combined with music increased long-term and long-lasting spatial memory. Body weight in "music", "trained" and "trained music" groups was significantly higher at the end of the experiment than in controls. In the same three groups, brain-related relative adrenal weights indicated no chronic distress, but elevated blood glucose and decreased stress-hormone levels in peripheral blood suggested eustress. Acoustic startle reflex (ASR) and pre-pulse inhibition (PPI) onset latencies were significantly decreased in these animals vs. control, but the ASR peak time was attenuated only in the "trained" group vs. both controls and "music" group. PPI peak amplitude of "trained music" rats decreased vs. "music" animals. In the rats' co-ordination performance, no difference was seen.

Conclusion: Rodentized *Mozart*'s sonata and moderate intensity treadmill exercise as well as their combination, applied regularly over the 10 weeks, caused no chronic stress or anxiety in the animals, but induced temporary eustress that promoted hippocampus-dependent learning process and memory fixation. Both expositions – likely acting on both hemispheres – were able to change the cholinergic innervation of ASR/PPI central area which converges at the level of the reticularis pontis caudalis with "limbic CSPP" circuitry (hippocampus, prefrontal cortex, striatum, pedunculo pontine tegmental area, etc.) and enhance rewarding effect of mesolimbic and mesocortical dopaminergic projection in nucleus accumbens.