reported, this point demonstrates the abuse of test persons in a plight for aeromedical and technical research in Germany in WWII.

Learning Objectives:

1. Learn about human performance limitations in flight tests.
2. Understand and discuss need for in flight tests of rescue devises as an ejection seat.
3. Know the historical background of ejection seat developments in the 30s and 40s.

[346] SPEECH INTELLIGIBILITY IN NOISE: WHAT IS UNDERSTOOD AND HOW CAN IT BE TESTED?

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OBJECTIVE: During flight operations significant background noise levels may occur. Beside elevated stress levels intelligibility of crew and radio communication can be affected. As the impact of background noise and individual hearing ability is generally not well determined, standardized and reproducible audiological methods to test speech intelligibility in noise are required. **METHODS:** First the background noise level during flight in several types of airplanes and helicopters was determined. Beside the determination of ambient noise levels in cockpits the level experienced by flight personal was measured in the ear canal using (1) passive and (2) active noise cancellation ear protection headsets. Secondly, the dependency of speech understanding in cockpit noise from individual hearing loss was investigated in normal hearing and hearing impaired crew members using the Freiburg Monosyllable test. As a possible alternative the Oldenburg Sentence Test (OLSA) was investigated in a cohort with varying degree of hearing impairment. This test is the German version of matrix sentence tests that adaptively determines the signal-to-noise-ration (SNR) at a given noise level where 50% of words are correctly understood and is available in various languages with reference data for comparison. **RESULTS:** Cockpit background noise levels determined in the ear canal often exceed 85 dB (A) and make passive and active noise cancellation necessary to prevent from potential temporary and permanent threshold shifts. Slightly hearing impaired subjects required significant higher speech presentation levels to overcome background noise and to obtain the same word recognition scores in the monosyllable test. Our results in the OLSA demonstrate that hearing impaired subjects require higher speech presentation levels but also higher SNRs to correctly understand. **CONCLUSION:** Medical examinations of crew members usually include the determination of intelligibility of numbers or monosyllables in quiet, but to fully understand the effect of elevated noise levels, more elaborate and standardized tests are required to predict reliably the impact of noise on speech intelligibility.

Learning Objectives:

1. Examples of in-the-ear measured background noise levels in airplanes and helicopters and the noise reduction achieved by active and passive protection.
2. Overview of matrix tests to determine signal-to-noise-ratios necessary for proper understanding in individual subjects.
3. Understand the impact of background noise on speech intelligibility and communication.

[347] EXTENDED PSYCHOPHYSIOLOGICAL ASSESSMENT DURING A SIMULATED SPACECRAFT DOCKING EXPERIMENT

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INTRODUCTION: In former joint space studies of the IBMP, RSC Energia and the Institute of Aerospace medicine (DLR) on MIR and ISS cardiovascular measures were registered to assess the physiological cost of cosmonauts during their docking training. In parallel the fundamental frequency of voice was analyzed to obtain information about the unconscious subjective evaluation of the subject's perception of situation control. The results of the studies onboard MIR and ISS provided evidence that the docking training did not increase "voice-stress" indicators or indicators of enhancement of the cardiovascular arousal. As far the performance of the cosmonauts was rather good this could be seen as a valid indication of cosmonaut's proficiency and their expectable reliability in running a docking maneuver. As a next step a very classic but robust Event Related Potential (ERP) design was implemented. We tested the possibility to use the component P300 to assess and monitor the individual cognitive difficulty of operators in a certain docking task. The space study is still in preparation; a ground based study was run. It was expected that during difficult tasks the secondary task is performed worse and the P300 has smaller amplitude and longer latency. **METHODS:** The study was run within the complex "envihab" of the DLR. The participants were volunteers. The test session consisted of 6 standard tasks (condition "easy") and one really difficult task (condition "difficult"). A training model of the flight hardware in the Russian segment of the ISS was used. An EEG-electrode system with active dry electrodes was applied. **RESULTS:** The magnitude of the P300 was smaller and its latency was larger for the difficult task than for the easier task. We consider it important, that is was possible that for the P300 differences statistical significances could be assessed within single subjects using all evoked EEG-episodes for each channel. **CONCLUSIONS:** In a ground-bases study we demonstrated the possibility to assess the cognitive difficulty by means of the ERP component P300. This additional psychophysiological assessment could improve the performance and behavioral assessment during the docking training and thus enhancing mission safety.

Learning Objectives:

1. Learn what is indicated by a P300 and what is new in the present use.

[348] OXIDATIVE DEFENSE IN MAMMALIAN MACROPHAGES - THE INTERNATIONAL SPACE STATION EXPERIMENT TRIPLE LUX A

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INTRODUCTION: Due to their exceeding sensitivity to gravitational changes, immune cells represent an ideal model system to understand how gravity on Earth is required for normal mammalian cell function, how cell function is impaired by altered gravity, and how cells adapt to the new situation. Knowing the cellular mechanisms of how gravity influences macrophageal cells is an invaluable requirement for the provision of therapeutic or preventive targets, for a better risk assessment, and the development of in vitro tests for medical monitoring. **METHODS:** The International Space Station (ISS) experiment TRIPLE LUX A investigated the oxidative burst reaction in NR8383 rat alveolar macrophages during longer periods of microgravity, determined the gravitational threshold for the burst reaction, and elucidated possible adaptation mechanisms. After an extensive test and development program, the experimental conditions and timeline for TRIPLE LUX A and the mission logistics, involving labs in Switzerland, Germany and the U.S. (Space Life Science Labs SLSL at Kennedy Space Center) were successfully established, optimized and verified. TRIPLE LUX A was uploaded with Space X CRS-6 and two complete experiment runs were performed in the BIOLAB of the COLUMBUS module. **RESULTS:** In preceding parabolic flight, 2D clinostat and centrifuge experiments, we investigated the influence of gravity on the release of reactive oxygen species (ROS), which responded rapidly and reversibly to altered gravity within seconds. ROS release was reduced in microgravity and enhanced in hypergravity. During the TRIPLE LUX A ISS experiment, we confirmed that ROS release is highly sensitive to altered gravity, detected a fast adaptation to the new gravitational environment and were able to quantify the relation between the gravitational force and ROS release. **DISCUSSION:** Phagocytes and the NADPH oxidase enzyme – triggered oxidative burst reactions are part of the ancient innate immune system, and represent the most important barrier for microbes invading the body. Thus, it could be possible that the gravitational conditions on Earth were one of the requirements and conditions for development of the molecular machinery of the oxidative burst reaction.

Learning Objectives:

1. The combination of parabolic flights, 2D clinostat and ISS experiments provides the possibility to investigate how cell function is impaired in altered gravity and how cells adapt to the new situation. We provided experimental evidences that the oxidative burst reaction in mammalian macrophages is strongly dependent from the gravity field on Earth.