

Cognitive performance changes in a dry hyperbaric environment equivalent to 180 meters of seawater

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Abstract

Cognitive performance changes were examined during the saturation phase (4 days) of simulated deep-sea diving (180 metres) and during the decompression phase (7 days) with four professional divers. Three tasks were investigated: a zero-order pursuit tracking with four difficulty levels (two preview and two amplitude conditions), a focussed attention reaction-time task with zero, compatible and incompatible distractor signals and a spatial working memory. The performance data showed that all tasks were impaired by the hyperbaric conditions of 19 bar. Spatial working memory was impaired as were tracking and focussed attention performance. The data suggested that high pressure impaired tracking performance largely by affecting the visual information processing component. In the focussed attention task reaction time was prolonged, but the ability to filter out response-irrelevant signals was not affected which indicates that high pressure does not lead to a general slowing of all information processing.

The results also supported the possibility of selection divers for optimal execution of certain tasks in dry hyperbaric conditions during the planning phase of a dive. However, before using the simulation tasks of present study the results should be validated with regard to real tasks and, furthermore, whether they can be generalized to different levels of pressure should be examined.

Introduction

Off-shore divers play an important role in, for example, the exploration of marine energy sources. Together with the development of saturation diving techniques and the extension of underwater operation areas the demands on divers have also increased. On the one hand the diver must master modern underwater working-techniques, on the other it is necessary to move and work in an environment for which the human body is not suited. As a consequence, the diver must meet considerable physical and psychological demands in order to guarantee a safe stay in the hyperbaric environment. In order to perform efficiently, cognitive and motor skills are required in addition to the usual diving qualifications (Zinkowski, 1978). One possibility for increasing work safety and effectiveness in the underwater workplace is selecting divers for specialized tasks during the planning phase, based on their individual cognitive and motor skills.