

many of the general principles of dive planning and the specific challenges of so-called technical diving.

From this work an understanding evolved that impaired diver performance is not synonymous with nitrogen narcosis and that the latter is only one of many factors that come to play a part in determining the effectiveness of working divers, be they hunter, photographer, scientist or commercial diver.

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MENTAL FITNESS IN TECHNICAL DIVING FOR SPORT SCUBA DIVERS

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Summary

Technical diving requires not only elaborate technical equipment but the appropriate readiness to come to terms with the necessary technical basic knowledge. Technical diving requires a particularly high level of self-control mechanisms. An essential part of the examination for diving is assessment of emotional stability, reliability, capacity for self-control, intelligence and social behaviour. These are fundamental for safe diving. Mental training is one component of training designed to pre-program the brain's solution-paths and behaviour sequences by thinking them through repeatedly and practising repeatedly until they run reflexly in critical situations.

Keywords

Fitness to dive, mixed gases, performance, recreational, training.

Introduction

The main cause of diving accidents is human failure. Decompression sickness is a bodily organic illness but, in most cases, it is wrong human behaviour which is the triggering factor. There have been extensive studies of diving accidents triggered by human factor.

Technical diving poses particular demands on the sportsman's personality. Technical diving is not a spontaneous recreational activity, just for fun, but requires

thoroughgoing theoretical knowledge and inner readiness to behave appropriately and react correctly to the technical conditions. The diving fitness examination must therefore involve an assessment of mental performance capability. This means not only the exclusion of psycho-pathological syndromes (psychoses, depressions etc.), but requires a differentiated assessment of emotional stability and capacity for self-control.

Accident prevention does not consist only of retrospective fault analysis but should include training in behaviour sequences which avoid or counter inappropriate actions. The objective of mental training is to pre-program thought sequences and establish these sequences as reflexes. Just as the optimum fin stroke can be achieved by practice, situation analysis and decision processes can also be practised. In problem situations information is provided from different memory stores and perception organs while solution paths are developed through a number of neuronal pathways and brain centres as testing and evaluation must take place, according to the principle of trial and error, before the final action plan is established. Finding a solution path requires many small individual steps. Repetition, and learning by example, can shorten solution finding. This makes neural pathways free again for spontaneous reflections. Decision processes which, in theory, run repeatedly via the different brain centres are stored in memory by practice via associative paths and run in practice as reflex.

Mental fitness in fitness for diving examinations

There are standardised suitability tests for professional and naval divers. The G UW (emotional dimensions under water) test was developed in the German-speaking area for sports divers in order to find indications of hazardous personality factors during the fitness for diving examination.¹

The G UW test covers the following variables:

- Capacity to identify emotionally conditioned bodily reactions
- Ability to identify personal emotions
- Achievement motivation
- Readiness to take risk
- Diving addiction

One needs to assess to what extent the diver allows himself to be led by his emotions, without recognising the fact, and the chances of dangerous behaviour due to excessive achievement motivation and readiness to take risks. There are considerable problems in Germany with these factors as shown by repeated fatalities among sports divers in deep cold waters.

A decisive prerequisite in technical diving is a well-pronounced self-control function. Digman² has defined 5

basic qualities of the successful sports personality:

- social maturity and intelligence
- social activity and capacity to carry through a plan determination
- will to achieve and stamina
- self-control and stress-resistance.

If, in the course of the examination, a significant deficit comes to light in one of these areas, fitness to dive must, for the time being, be questioned.

Mental training as a part of diving training

There have been numerous investigations of the effectiveness of mental training in competitive sport. The objective of such a training is to achieve psychic stability, maximum physical performance and fighting spirit to the point of aggression, and in so doing, self doubt, anxiety and distractibility are reduced.^{3,4}

In the case of sports diving there is a different objective. It is not maximum performance which is needed. Psychic stability and reduction of fear to are needed to avoid panic reactions. Inherent in diving are a multiplicity of fear-triggering factors arising from environmental conditions, the demands of technical equipment and the influence of altered gas partial pressures on brain performance. However also emotion-positive factors play a role such as thrill, self-satisfaction and a sense of achievement.

Behaviour control runs in accordance with underlying neuro-physiological function principles. Here three principles of functional disturbance can be differentiated:

- emotional flooding, when overactivity of the brain stem blocks cerebral activity;
- conscious fixation on a personal objective, when activity of one brain centre blocks input from other centres;
- excess of information, when simultaneous activation of too many brain centres impedes evaluation.

The brain has only a limited processing capacity. If neural activity is increased too much, further neural impulses cannot be processed. With mental training it is possible to reduce neuronal overexcitement and to extend receptive capacity by attention training.

In the case of sport divers all three disturbance models can be the cause of accidents. In the case of novice divers it is fear which is the ruling factor. Behaviour controlled by fear is characterised by affective overloading. The result of emotional flooding is overactivity of the fear and panic centres which restricts the running of logical thought processes in the cerebral cortex. Achievement brings feelings of extreme well-being to the point of euphoria. Here overactivity of the pleasure and reward centres restricts logical thought processes in the cerebral cortex. When

diving altered gas partial pressures directly influence the activity of neurotransmitters.

Another disturbance over-fixation on a personal objective. Attention is directed to a defined goal and all further information input is blocked off. This "tunnel vision" pattern of behaviour is shown by high achievement motivated persons, counter-phobic divers or depth-addicted divers. Attention is focused so the environmental signs and indications are not perceived.

The danger in technical diving is activation of too many information input systems so that excessive input impedes conscious processing. Technical diving does not allow freedom for spontaneous actions such as going a bit deeper because the wreck is so photogenic.

A decisive variable in mental training is the type of attention. Differentiation is based on the type of concentration. Fear, or behaviour controlled by depth addiction, is characterised by very narrowly bundled attention (focusing). There is a lack of insight for the reality of situation. Here the objective of training is a greater divergence of attention by incorporation of further information systems. Technical diving on the other hand requires a tight focusing on the specific dive plan.

Training content and objectives are designed in line with the different underlying mechanisms. Mental training nevertheless follows these basic steps:

- 1 Recognising a problem
- 2 Situation analysis
- 3 Decide on actions to deal with the problem
- 4 Action plan
- 5 Feedback

The most important step is recognising a problem. It may be emotional overloading, fear or euphoria, the hunt for subjects to photograph, or the urge to go deeper. To be able to act, one must first recognise the need for action. The aim of mental training is to avoid being surprised by a problem and to register approaching difficulties in advance. This allows the possibility of being able to take the necessary corrective action in good time.

The basic requirements for self-control are the regular checking of emotional state, autonomic nervous system function status, intellectual performance capability, technical data and comparison of how closely the actual dive corresponds with the plan. It also includes recognising possible indications of incipient nitrogen narcosis. As soon as a possible problem has been consciously perceived a diver should analyse the situation and evaluate whether an actual hazard is posed or behaviour correction needed.

Emotional stabilisation is always required before action. It is possible that relaxation techniques are required. Stabilisation also includes a conscious act of emotional self-

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control, if the current mood (fear, euphoria or indifference) is evaluated as being a source of danger.

After successful stabilisation comes the drafting of a problem-solving strategy. For this, reverse polarisation of the attention variables is required. Too narrow a focus, as in achievement oriented situations, must now be widened. Scattered attention must be concentrated on the problems.

After every action plan there is a feedback loop for assessing efficiency and after this possibly a modified plan.

A thorough training provides as wide a variation of different situations as possible. The greater the frequency of the exercise the shorter the feedback loop becomes as unnecessary trains of thought fall away. Practice results in memory storing, so when the situation occurs many thought sequences run automatically and unconsciously. In this way sufficient neural pathways remain clear to process current information effectively.

Conclusion

Technical diving does not contain any greater risk than traditional compressed air diving, as long as the diver is in command of the technology. A precondition for this is

that he acquires the necessary theoretical knowledge and is prepared to conduct the dive in accordance with the technical requirements. A training model for training mental fitness is available. It remains to be seen to what extent commercial interests or safety aspects dictate the actual training of technical divers.

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