EDITORIAL

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Use Increasingly the Potentials of Individualization in Sports and Health Coaching

Potenziale der Individualisierung im Sport und Gesundheitscoaching stärker nutzen

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Knowledge of the influence of genetic and epigenetic factors on the trainability and performance capacity has potential for greater individualization of training over the whole lifespan (3, 6).

Inadequate Individualization of Training

There is considerable heterogeneity in the capacity to react to regular physical activity; the same training loads can lead to clearly differing training adaptations (4). In addition to age, gender and ethnic origin, the training-related characteristics of the phenotype contribute to the variability of the training reaction. Current results in molecular biology and genetics also point to the appropriateness of specific and individualized training (7). The adaptation of muscles in endurance and strength training activates different molecular signal pathways and adaptation regulators and these can be optimized, among other things by appropriate timing and various nutritional strategies (13). Individualization of training is needed in order to apply this and other knowledge from science for a targeted control of training stimuli. The potential of individualization in high-performance, health and rehabilitation sport is presently not sufficiently used.

In high-performance sport, which has the goal of (maximal) development of individual performance conditions, many sports leagues still hang on to outdated overall training concepts and the individual situation and the individual requisites of the athlete are not taken adequately into account. For years, training data have been recorded for high-performance athletes, but so far, there has been no systematic evaluation and analysis of these data, particularly under the

detection of individual profiles (training types) (8). The adaptation and training type of the athlete cannot be recognized from a purely descriptive data evaluation nor can well-founded concepts be created for individual training plans. The modern possibilities of technological innovations, the use of wearables, are also used too little for the individualization of performance training, that is, the optimization of stress-load-regulation. The specialist competence of the trainer, especially with respect to the stress-load regulation is needed for individualization of the training load. The more precisely the trainers know the individual ways of their athletes' reaction, the more targeted the load control can be implemented. If the trusting and cooperative athlete-trainer relationship can no longer be maintained due, for example to the concentration of performance base, there are new challenges for the individualization of training.

In health sport, which has the goal of maintaining health and strengthening health resources, the recommendations of the WHO and other professional societies are of only a general nature thus far. They are limited to citing scope and intensity in physical activity, (for example 150 min/week at moderate intensity) and only make global comments on strength training (training of larger muscle groups, at least twice a week). Hardly any attention is paid to age structure. The WHO recommendations differ only minimally among the age groups 5-17 years, 18-64 years and older than 64 years. Differentiated statements on training of endurance, strength, mobility and coordination are lacking. No statements are made on the proportioning of motoric capacity for children, adolescents, adults, or for elderly and very old people. A training program for a healthy 75-year-old woman or a 75-year-old man must be proportionally directed more to coordination (sensomotorics, neuroplasticity), mobility and strength than the preventive program for middle-aged (30-50 years) employed persons. The latter would be better able to improve work capacity and health via aerobic endurance training, since that form of exercise offsets sitting activity or work stress more effectively.

Research has made enormous advances in recent years, among other things in cardiovascular disease, Diabetes, Alzheimer and cancer prevention by physical training. But if this knowledge is to attain high efficacy in practice, individualization of the training program is required which takes performance capacity and resilience into account.

In rehabilitation sport, which has the goal of reinstating health, therapy programs have been developed over many years for various diseases. Here, too, it is seen that successful implementation of the therapy or rehabilitation plan in practice is only successful when the medical diagnosis and the special anamnesis of the patient are taken into account.

Load-Stress-Model for Individualizing Training

Training is too complex to be controlled with simple models in the sense of a linear stimulus response or a cybernetic loop control model. Numerous modulators or influencing factors are in operation between the training load and the resultant stress. Various interactions result based on the self-organization of central nervous system and molecular proces- ›

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ses. The load-stress-regulation model (9) takes into account the most important modulators needed for optimal individualization of training. The term load is understood as the sum of all training demands affecting the athlete, including biomechanical and emotional loads. Stress is expressed in the differing demands on the organismic function systems and depends on the emotional and volitional performance condition. Stimulus-effective training load always initiates first a certain stress in the function systems involved. Since the same training load elicits different individual stress, control of the training should be made via both the prescribed load and the physical stress which it elicits. Self- and outside observations, as well as biological parameters are suitable for recording stress reactions. For the latter, easy-to-use wearables are available with which 24-hour surveillance of the athlete is possible (phases of activity or inactivity, sleep rhythms, etc.). Statements on stressability or limited stressability can be made based on these data concerning which indicators of targeted stimulus application are important and how to avoid overload.

The autonomic nervous system (ANS) as the main integration system for the multiplicity of afferent signals can make an essential contribution to the individualization of training by recording its activity during the training- and recovery phases. Studies to date show that a good recovery state is expressed in high vagal parameters of heart rate variability (HRV) (10, 11) and can be taken as prerequisite to intensive training. Prospective randomized-controlled training studies have shown that performance development in endurance types of sports can be positively influenced by HRV monitoring (2). Retrospective training and HRV-analyses confirm that vagal HRV-parameters are suited to detect a functional or non-functional overreaching (NFOR) (2, 12).

To individualize the training load using the HRV, it is recommended to initially determine the distortion of vagal HRV parameters (e.g. RMSD) at mostly regenerative training loads over a period of several days. The planned training program can be started once this so-called individual baseline has been determined. Decisive for training progress is then to undertake justified deviations from the original training plan based on the HRV. If marked distortions of the vagal HRV parameters occur during the training process, the training program should be appropriately adjusted. According to the studies by Plews et al. (12), corrections should only be made based on a trend lasting several days or on the 7-day average. Distortions after one day or below the baseline do not justify correcting the training plan.

In summary it can be said that training load elicits heterochronous reactions in numerous, interactive organ systems and biological signals. Adaptation mechanisms thus have high dynamics and complexity, and their function is always individual. The basic principle of individualized training is to detect suitable parameters for recording the stress and regeneration state and to implement these into the training process in such a way that optimal training effects can be achieved. The HRV is a very promising marker in this, and its application should not be limited to high-performance sports.

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