On the Long Term Behaviour of the Performance-Potential-Metamodel PerPot: New Results and Approaches

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The Performance-Potential-Metamodel PerPot describes the dynamics of load performance interaction by means of delayed flows between potentials. The basic idea is that of antagonism: The load input in the same way feeds a strain potential as well as a response potential, which then decrease respectively increase the performance potential by delayed flows. These delays play an important role in characterizing the type of resulting dynamics: Depending on the relation between the delay values, for example, the effect of super-compensation can appear or not.

Analyses have shown that modelling original input-output-interaction of athletes can be improved by adapting the delay time series - considering the delay values to be time-dependent. Under the assumption that delays (on a very abstract level, of course) model the internal dynamics of an organism this means that load input not only influences the externally measurable performance but also the athlete's internal state.

Accordingly, a two-level-PerPot has been developed, where the performance potential of the internal PerPot controls the delays of the external one, both fed with the same load input. The interpretation is that training not only improves external performance by optimising production and transfer rates of performance indicating substances but also improves capacity and speed of the producing and transferring components.

In the long term approach of PerPot a irreducible loss of performance potential has to be modelled. Therefore a type of atrophy has been added, which is modelled by a flow reducing the performance potential. One of the consequences is that particular training strategies like over-training can cause delayed performance break downs, which then cannot be compensated if the performance state is getting worse because of atrophy. Such effects can easily be demonstrated and analysed using the two-level-PerPot.

Finally, long term development and long term atrophy together form an antagonistic model, which can be used to discuss the dynamics of the increase of a "vital potential" in the youth and its decrease in the age. This model can be used as a frame for a life-time-version of PerPot:

On the one hand a life-time-PerPot can help to get ideas about what types of atrophy functions seem to be reasonable for the long-term-model. On the other hand it might help to find optimal schedules for a careful and preserving life-long-training.