Sports-spanning training variability augments individual success potential in elite sport

Arne Güllich & Eike Emrich
University of the Saarland, Institute of Sport Science

Introduction and Previous Research

In a previous paper (Güllich & Emrich 2006) it was purposed, following the notion of Lakatos (1970), to extract the hard core of basic assumptions underlying current long-term training concepts in German applied training science in order to test it empirically:

1. Training is a long-term, continuous, goal-directed, methodical, and systematically controlled process.
2. Elite athletes participate in the training process in one sport for long periods of time. Early juvenile competitive success is a valid predictor for later success in elite sport. Success increases with growing duration of the training process.
3. There are positive long-term correlations between each, early juvenile success, discipline-related training volume, early supportive interventions for the juvenile training and long-term success in elite sport (figure 1).

![Figure 1: Assumed short- and long-term correlations](image)

Available time for training is considered a scarce good, and correspondingly, collectivistic steering measures in the support system (selection criteria and procedures) and individualistic approaches towards the support of the training process aim mainly at the increment of extensive and intensive training-related time-economy. Also in international literature has the approach widely been discussed, particularly with reference to the theory of “deliberate practice” according to Ericsson et al. (1993).

Standardized retrospective reports of 1,558 German national squad athletes in Olympic sports (standardized questionnaire; Güllich & Emrich 2006; Güllich 2006) indicated that a higher training volume in other sports beyond the individual’s current main sport and a higher variability of played sports is mostly associated with individual deceleration of the Juvenile training-, performance- and support-related development, but with higher long-term success in elite sport. In contrast, each, early juvenile success, training volume in the current main sport, and volume of supportive interventions turned out to have either no or systematic negative effects on later success in elite sport.

In the present study, the according hypotheses are tested in longitudinal design.

Methods

244 national squad members volunteered for two measurements (t₁-t₂=2.8 to 3.0 yr; M ± SD, 3.0), 121 were older (24 ± 5 yr). A special coding technique enabled the inclusion of success data in multiple linear regression (MLR) and MANOVA procedures (Bortz, 2005; Güllich & Emrich, 2006). Explanation of elite sport success at t₂ was approached by iterations of independent variables (stepwise inclusion; criterion p<0.05) including complexes of former and current success, training volume and continuity in the main sport and in other sports, and inclusion in support programs, each measured until t₁ (for details see Güllich & Emrich 2006, Güllich 2006).

Results

No consistent model could be extracted for the explanation of success within juvenile age and in the age of transition from junior to elite sport by means of previous success-, training- and support-related variables, both, univariately or multivariately.

guellich@dosb.de
e.emrich@mx.uni-saarland.de

Among elite athletes, training volume in the individual’s current main sport at any age does not contribute significantly to explaining inter-individual success differences. In contrast, success is best explained by the following linear model (figure 2):

\[ \text{Success } t_2 = 22.02 + 0.71^*a - 0.20^*b - 0.19^*c + 0.07^*d \]

Note: Lower values represent higher success

\[ R^2_{adj} = 0.51 \ (n=89) \]

a success at t₁
b training age in other sport(s)
c duration of injury-induced training reduction
d duration of inclusion in support system interventions

![Figure 2: Predicted and observed success](image)

The data signify, that more durable and voluminous training in varying sports, longer periods of injury-induced training reduction, and a longer period of the sporting career beyond interventions of the support system and their intended controlling effects are associated with higher success in the long run. Just two variables, success at t₁ and training volume in other sports, clear 41 % of later success variance. Consistently, also within elite sport age, MANOVA results elicit that each, the portion of the current main sport in total training volume at t₁ and the participation in federations’ intended training control interventions correlates negatively with the success development from t₁ to t₂.

Discussion and Conclusion

The longitudinal study confirms central aspects of previous results from athletes’ retrospective reports and contributes additional findings. They indicate considerable inconsistence between a socially constructed ideal-type of long-term careers and empirically displayed conditions for success. The results discord – at least partially – the hard core of basic assumptions underlying traditional, time-economically founded attitudes and concepts of long-term training and support processes, such as linearity, continuity, goal-direction, and control of training.

Conditions for short- and long-term success in elite sport turn out to be not only inconsistent, but in parts even contrary. While the executed training volume in the current main sport possesses no or negative effects, sport-spanning training variability in all ages displays consistent positive correlations with elite sport success, though.

From the perspective of training science, an interesting focus for future studies will be, to what degree the latter phenomenon is based on effects of addition, selective responsiveness and/or interaction between training loads varying concerning their content and the effects’ possible longitudinal variation. A candidate theory for explanation could be found in stochastic resonance: It has been shown for a range of dynamic threshold systems that resonance probability is increased in the presence of random noise (for review see e.g. Gammaitoni 1995). The training in varying sports could then represent the perturbation that enhances the responsibility to the training loads in the current main sport.

References


Güllich, A., Emrich, E. (2006). Evaluation of the support of young athletes in the elite sport system. ESSS (i. pr.)