



Title:

Prediction of competition performance based on technique tests in Olympic air rifle shooting

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Abstract:

Introduction: The primary goal in sport shooting is to maximize the number of center hits. To achieve this, the aiming point trajectories on the target must be minimized or made predictable. This can be achieved by optimally controlling the contact forces on the sports equipment (Kredel, Tartaruga, Siegenthaler & Hossner, 2014). The quality of aiming point trajectories can be described by different features that functionally interact for an optimal result and inform a specific technique. Since Swiss Shooting currently selects athletes only based on yearly competition results, the question arises which benefit this selection concept would gain by adding technique characteristics. To that aim, different prediction models are calculated and interpreted in this study.

Methods: Since 2009, all FTEM-T3-ranked and higher-ranked athletes of Swiss Shooting have been sending training data of aiming point trajectories which were recorded with a SCATT training system (100 Hz). Currently, the database contains 140'610 air rifle shots of 321 athletes. Each training data set consists of at least 40 shots, so that measures for holding stability, approach, aiming, and release quality of each individual shot can be determined and aggregated to a technique score (TS). This TS was linearly scaled between 0 (worse than 10% of all available shots) and 100 (better than 2.5% of all available shots). Based on these data, three different prediction models are tested:

- (1) past competition results (PCR) on future competition results (FCR)
- (2) technique score (TS) on future competition results (FCR)
- (3) past competition results (PCR) and technique score (TS) on future competition results (FCR)

Only competition results achieved between 2 to 4 months after a PCR/TS were considered for the prediction. The quality of the prediction was operationalized by the coefficient of determination R^2 .

Results: 2 to 4 months old PCR explained 65.3% of the variance of FCR, while 54.1% of the variance of FCR can be explained by 2 to 4 months old TS. The combined model PCR and TS can explain 69% of the variance in competition results achieved 2 to 4 month later.

Discussion/Conclusion: A combination of PCR and TS in the period 2-4 months before the FCR explains almost 5% additional variance of the FCR than pure PCR. Therefore, the benefit of combining the prediction models is not directly obvious. Rather, it seems that most of the explanatory content of the TS is already contained in the PCR, which is supported by the high explanatory content of the TS alone of over 50%. Three consequences result from these results for the selection practice: (1) If current competition results are available for the individual athlete, they allow a good prediction of future competition performances. (2) If current technique scores from training sessions are also available, the prediction quality can be marginally improved by adding them. (3) If no current competition results are available, the technique scores from training alone can clarify a considerable proportion of future competition performance.

References:

Kredel, R., Tartaruga, D., Siegenthaler, R., & Hossner, E.-J. (2014). Präzisionsleistungen im Olympischen Luftgewehrschiessen. In (o. Hrsg.): 6. Jahrestagung der Sportwissenschaftlichen Gesellschaft der Schweiz (SGS). Sportwissenschaft in Bewegung - Bewegung in der Sportwissenschaft. Freiburg. 13.-14.02.2014