**Performance determinants in junior- and elite-level air-rifle athletes**

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**INTRODUCTION:**
Sport shooting is an accuracy and precision sport, in which multifactorial processes occur simultaneously and sequentially, requiring many factors to be controlled at once [1]. Especially in air-rifle shooting, previous studies examined various factors and their influence on shooting performance [1]. So far, the influence of different factors in one comprehensive model has only been examined across technical factors [2]. Therefore, the aim of this study was to identify the role of technical, coordinative, physiological and psychological factors that best predict shooting performance of both junior-level and elite-level air-rifle athletes.

**METHODS:**
Federal squad athletes of the German Shooting Federation participated in the study (n = 18 junior- and n = 18 elite-level athletes). Participants performed a simulated air-rifle competition of 60 shots according to the ISSF regularities. Based on a systematic review [1], the following performance factors were assessed during shooting: the aim point trajectory of the weapon via SCATT (technique), postural balance in ML- and AP-direction via a 3D force plate, as well as muscle activity and heart rate via EMG (coordination). Before the competition started, athletes completed a questionnaire on their current psychological well-being. On two other consecutive days, athletes performed a steps-test, a computer-based diagnostic instrument to measure shooters' coordination and concentration. Further, maximum isometric strength of the trunk and thigh muscles were tested using a force measuring chair. Athletes also performed a laboratory-based incremental endurance test on a treadmill to assess endurance capacities (both physiology). Principle component analysis was used to form orthogonal linear combinations for each test variables. Stepwise multiple regression analysis (MRA) with principle components (PC, PCs with the highest explained variance from each test were used for MRA) were used to test for variance explained in shooting score.

**RESULTS:**
Shooting results differed between skill levels (617,8 ± 4,6 vs. 621,3 ± 5,5 rings). MRA revealed four factors to be relevant for junior-level athletes: PC1: holding ability and cleanness of triggering ( = 1,58), PC2: maximum strength of leg abduction muscles ( = - 2,71), PC3: COP sway in AP-direction ( = - 2,05) and PC4: reaction and anticipation ( = 2,12). These variables accounted for 76,9 % of variance in shot score, whereas PC1 provided the highest contribution (technique). Four factors were relevant in elite-level athletes: PC1: concentration ( = 2,14), PC2: holding ability ( = 2,28), PC3: heart rate ( = - 2,94), PC4: COP-sway in AP-direction ( = - 3,08). These variables accounted for 86,8 % of variance in shot score.

**CONCLUSION:**
The results show that, depending on the skill level, a different combination of technical, coordinative, physiological and psychological factors is important for achieving a high shot score in air-rifle shooting.

1. Spancken et al. (2021) 2. Ihalainen et al. (2016)

**Topic:**          **Training and Testing**

**Presentation**          **Poster**

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