

JOINT ACCELERATION PATTERN OF THE THROWING ARM IN FEMALE TEAM HANDBALL

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INTRODUCTION

Throwing performance in team handball is considered successful when throwing velocity is accompanied by an increased level of accuracy. The purpose of the present study was to study the effects of the load deriving from game circumstances in throwing performance and to examine if the movement pattern of the throwing arm is modified throughout the simulation of a team handball game.

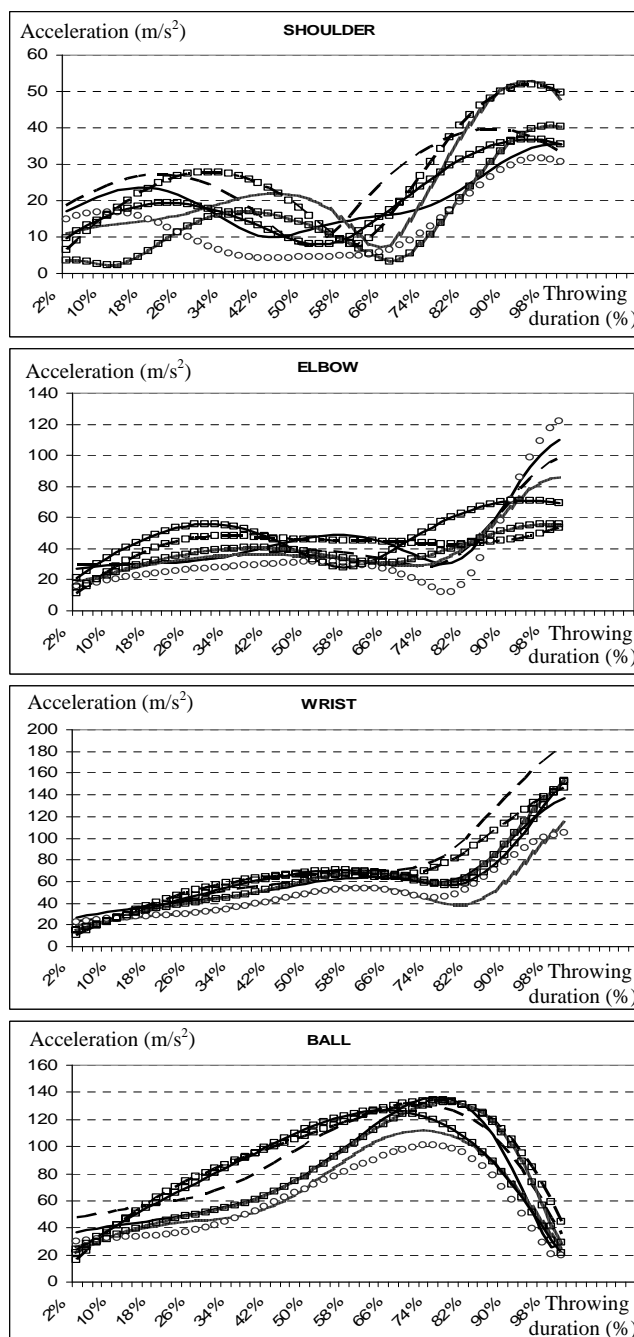
METHODS

Six female handball players (20.6±1.8 yrs, 1.67±0.70m, 63.8±4.2kg) participated in the study. After a typical warm up, they performed 3 throws from a firm spot 7m away from a special target. The initial trial was followed by a 60min simulated gaming activity (2x30min), including the most representative handball activities [1]. Every 10min each subject performed 3 throws of which the second was always selected for further analysis. Velocity and acceleration of the ball and the joints (shoulder, elbow, wrist) were estimated in 3 axes, based on kinematic data collected with 2 high-speed cameras (Redlake, 125 Hz) and analyzed with the appropriate software (Peak Motus). Accuracy was evaluated as the ball deviation from the centre of the target. Accuracy data were collected with a digital camera (Sony 25Hz) and were analyzed with the Logger Pro3.2 software.

RESULTS AND DISCUSSION

The analysis of variance with repeated measures revealed a significant effect of time on ball deviation ($F=3.18$, $p<.05$). Accuracy was high at the initial measure (17.6±11.1 cm) and decreased during the simulation. Ball deviation from the target tended to increase; therefore there was a reduction of accuracy in the throws of the last 10min period of each half. The worst scores in terms of accuracy (46.2±14.6 cm) were observed at the end of the game. Ball velocity was low during the initial trial (15.4±0.8 m/s), increased during the first half (16.0±1.7 m/s) and was stabilized (15.8±1.7 m/s) during the second half. Analysis showed that the acceleration pattern of the ball and the wrist was consistent across trials. However, there was a time-dependent variability regarding the shoulder and the elbow revealing a pronounced loss of consistency in the acceleration pattern overall. The alteration of this sequence and the reduction of accuracy at the end of the simulated game lead to the assumption that there is a relationship between accuracy and joint acceleration pattern during a handball game, as accuracy requires a precise control of joint rotations [2]. Therefore, practicing accuracy at the end of the training, after a certain level of fatigue, is proved to be very useful for handball players.

Fig. 1. Acceleration pattern of the shoulder, elbow, wrist and ball for all 10min periods (from the beginning of every throw until the moment of the maximum velocity: 100%).



○ BS: Before Simulation

— A: 1st 10min period —□— D: 4th 10min period

--- B: 2nd 10min period -○- E: 5th 10min period

... C: 3rd 10min period —△— F: 6th 10min period

REFERENCES

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- Hore et al., *J Neurophysiol*, **3**: 1013-1025, 1996.