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SOME UPPER TRUNK PARAMETERS ON ACCURACY THROWING IN TEAM HANDBALL

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INTRODUCTION

Throwing accuracy and throwing velocity in handball are regarded as basic parameters of performance during competition. Several investigators have studied the relationship between the velocity of movement of the upper limb and accuracy in hitting target [1] and throwing on the spot or jump shot performance in handball [2]. The aim of the present study was to determine the effects of some trunk and ball release parameters on accuracy and non-accuracy throwing parameters.

METHODS

Two groups of subjects took part in the experiments: One group of 9 handball players, Turkish Handball National Team (age 25.44±3.28 yrs), another group of 9 handball players, the best league A3(age 22.66±1.58 yrs).All throws were recorded by two high speed cameras (100 Hz) and used Hubag (http://www.biomech.hacettepe.edu.tr/hubag) motion analysis system to acquire kinematics data. After a general warming up of 15 minutes, throwing performance was tested in an overarm throw towards a target at 6 m distance.

The athletes performed a standing throw with keeping the front foot on the floor after three strides. The subjects threw two times. The instruction was to throw as fast as possible aiming at a target of 60x60 cm positioned in a handball goal. Throws, which is placed inner side of target, are recorded as accurate. Mann Whitney -U test were used to compare differences between some trunk and ball throwing parameters.

RESULTS AND DISCUSSION

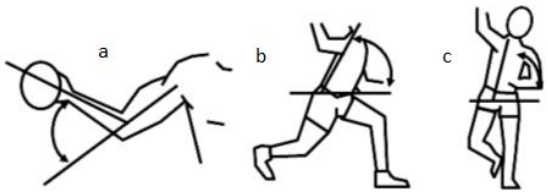

Figure 1. (a) elbow flexion, (b) trunk tilt forward, (c) trunk tilt sideways

Total 36 handball throwing (Group I: 11 accuracy throwing, 7 non-accuracy throwing; Group II: 6 accuracy throwing, 12 non-accuracy throwing) performances were recorded. The following kinematic variables were analysed: trunk tilt, trunk tilt sideway, elbow extension at ball release (Figure 1). There were significant differences between ball velocity and ball release angle among in accuracy overarm throwing. The kinematic measurements are listed in Table 1.

Table 1: Some kinematic parameters of upper trunk and ball release in accuracy throwing

	Accuracy throwing		
	Group I (n=11)	Group II (n=6)	p
	mean±SD	mean±SD	
$Elbow_{ext\text{-}angle}$ (°)	18.40±7.58	25.77±9.81	0.070
$Trunk_f$ (°)	42.76±16.56	34.44±17.61	0.191
$Trunk_s$ (°)	6.27±2.95	4.16±1.76	0.044*
$h_{ball\text{-}release}$ (cm)	199.93±17.95	180.82±30.69	0.159
$Ball_{release\text{-}angle}$ (°)	58.87±24.09	22.42±7.92	0.003*
Ball velocity(m/sn)	16.45±5.78	23.54±6.75	0.035*

CONCLUSIONS

The trunk movement may play a role through transfer of angular momentum which should be indicated by any relationship between throwing speed and trunk movement parameters [3]. Trunk movements during handball throwing were similar to those of other throwing activities as attested by the few studies focused on the trunk movement. The trunk flexion at ball release, measured at 42,76° for Group I, was between 31° and 65°found by Stodden at all.(2001) [4], for baseball pitching and by Rash and Shapiro (1995) [5] for football passing. Group II showed less trunk forward tilt value in accurate shots.

Tillaar and Ettema (2007), in their study of subject who achieved more ball velocity indicated that they have a smaller angle of elbow extension and according to others and the rewards of acceleration for a long time in the ball trajectory [1]. In this study, a larger ball release angle and less ball velocity of Group I achieved more accurate shot. Upper body kinematics for Group II, which is necessary for an optimum shot, is not sufficient for proximal-to-distal sequence movement. The lower ball velocity of Group I was

compensate by the increased ball release height, which was caused by trunk tilt sideways angle at ball release.

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REFERENCES

1. Tillaar ., Ettema G. A three-dimensional analysis of overarm throwing in experienced handball players, *Journal of Applied Biomechanics*, **23**:12-19, 2007
2. Pori P., Sibila M. Basic kinematic differences in arm activity two types of jump techniques in handball, *Kinesiologia Slovenica*, **9:2**, 58-66, 2003.
3. Tillaar R., Ettema G., Influence of instruction on velocity and accuracy of overarm throwing, *Percept of Skills*, **96(2)**:423-34, 2003
4. Stodden D.F., Fleisig G.S., Mc Lean S.P., Lyman S.L., Andrews J.R. (2001). Relationship of pelvis and upper torso kinematics to pitched baseball velocity. *Journal of Applied Biomechanics*, **17**, 164-172
5. Rash, G.S., Shapiro, R. (1995). A three-dimensional dynamic analysis of the quarterback's throwing motion in American football, *Journal of Applied Biomechanics*, **11**, 443-459