

THE STUDY OF RELATED FACTORS WITH BALL VELOCITY OF THROWING OF GIRLS AGED 11-12 YEARS OLD

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KEY WORDS: overarm, the distance of back swing, the ratio between the distance of step and height, the angular velocities of joint.

INTRODUCTION: The forceful overarm throwing is considered a fundamental movement for many skills. In addition, it is also regarded as a characteristic of child's development. As to the researches of development, gender difference is also concerned by experts of development. Research related to child motor development traditionally follow the structure of Burton's (1992) on amendment of Development Sequences for Overhand Throwing table to measure throwing patterns. But overarm throwing is a kind of fast motion especially for the period which is from backswing to release. The traditional way mentioned above can't provide detailed data. The purpose of the study was to find out the related factors with ball velocity of throwing of girls aged 11-12 years,

METHOD: A high-speed camera (Mega Speed MS10K CCD, 120 Hz) was used to record the motion of 12 girls aged 11-12 years old (2D). The study asked these subjects to throw the ball far away as possible as they could. The cut-off frequency used was 6Hz. Person correlation was adapted to tell apart the gender difference. The ball velocity meant third to fourth frame of ball velocity after the ball leaving the hand. The distance of backswing meant the distance the right hand moved from front to back. The ratio of step distance and height meant the quotient which come from step distance divided by height. The maximum velocity of shoulder, elbow and hip angle meant the maximum velocity of shoulder, elbow and hip angle happened during the right hand moved forward.

RESULTS: According to Table 1, As to girls aged 11 years old, there were no factors related significantly to ball velocity. As to 12 years old, the distance of backswing and the ratio of step distance and height were related significantly to ball velocity. The results mean that teachers of physical education could emphasize backswing and forward step for these girls.

Table 1 The gender difference of over-arm throwing of child aged 11-12 years old

	11 years			12 years		
	M	SD	P	M	SD	P
Ball velocity cm/s	1119.22	144.04		1233.13	222.29	
Distance of backswing (cm)	85.02	10.96	.467	96.59	22.81	.883*
Ratio of step distance to height	.22	.11	.426	.26	.11	.860*
Maximum joint angular velocity (°/s)						
Shoulder	911.40	285.95	.491	578.35	179.35	.361
Elbow angle	1131.67	295.65	.500	1020.37	156.20	.207
Hip angle	125.83	30.48	.373	206.67	68.78	.494

*p < .05

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