

DETERMINANTS OF SWING PERFORMANCE IN YOUNG BASEBALL PLAYERS

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Introduction: High level of swing speed during hitting is a specific batter's quality in baseball¹. Batting is a whole body movement, bat power comes from the lower extremities, passed through to the trunk and on to the upper extremities². Previous studies demonstrated correlations between maximal upper body strength, lower body strength and bat swing velocity¹, but is not clear if also maximal abdominal strength is involved and which of these body parts is the major determinant of swing performance.

Objective: To determine whether upper (UbS), trunk (TbS) or leg (LbS) body maximal strength correlate with maximal bat swing speed (BS) in young elite Italian baseball players.

Methods: Fifteen young male baseball players (mean (SD) age 17.0 (1.7) years, height 176.0 (7.5) cm, mass 73.6 (13.8) kg, and percent body fat 12.5 (6.6)) were tested for UbS by chest press, LbS by leg extension and TbS by abdominal crunch ergometers by indirect 1 RM technique. On the following day, maximal swing speed was evaluated by radar speed sensor, while the players were swinging "in air" without a ball. Kolmogorov-Smirnov test was used for normality distributions, Pearson correlation and multivariate linear regression was used to evaluate relations between outcomes; significance for all tests was set at $p < 0.05$.

Result: Descriptive statistic shows a symmetrically distribution of the observed values K-S prob > 0.05 . The range of data analyzed in this study are comparable to previous studies. There was a strong correlation between UbS and BS: $R = 0.793$; $p < 0.001$. However TbS and LbS seem to not related to BS (Table 1). Data suggest also a correlation between UbS, TbS and LbS, but the multivariate linear regression: $BS = 42.7 + (0.41 * UbS) - (0.11 * LbS) - (0.09 * TbS)$; $R^2 = 0.662$; indicates that only UbS significantly influences BS; UbS $p = 0.002$; LbS $p = 0.489$; TbS $p = 0.472$.

		Swing (mph)	Mass (kg)	Height (cm)	L.B.M. (kg)	UbS (kg)	LbS (kg)	TbS (kg)
Mean		64.2	73.6	176.0	63.6	80.7	56.7	54.3
±SD		5.5	12.0	7.5	6.5	12.9	7.4	8.9
Swing	R	-	0.218	0.36	0.163	0.793**	0.316	0.305
Mass	R	-	-	0.355	0.923**	0.425	0.709**	0.157
Height	R	-	-	-	0.361	0.0231	0.362	-0.287
L.B.M.	R	-	-	-	-	0.348	0.786**	0.131
UbS	R	-	-	-	-	-	0.533*	0.526*
LbS	R	-	-	-	-	-	-	0.286

Table 1: Pearson correlation; *= $p < 0.05$; **= $p < 0.01$; R= correlation coefficient.

Discussion/Conclusion: The main findings of this study is that upper body strength appears to be the main determinant of swing performance in young baseball players. On the contrary, maximal leg and trunk body strength seem to be not correlated to swing performance. This result is partially in contrast with previous studies, where correlations were observed between both squat, and bench press 1RM and bat speed¹ and between torso rotational strength and bat speed³. This differences could be related to the different testing modality used in our study compared to previous work (i.e. leg extension vs parallel squat; abdominal crunch vs rotational strength) and, possibly, to the confounding effect of coordinative abilities. Our data suggest that while total body strength conditioning is recommended in young baseball players, special emphasis should be given to maximal upper body strength training to improve maximal bat swing speed performance. Furthermore, since a good coordination is a characteristic of a good hitter² hence additional coordinative studies could be useful to understand the determinants of swing performance.

References:

1. Szymanski DJ, et al. *J Strength Cond Res.* 2006; 20: 231-240.
2. Hughes SS, Lyons BC & Mayo JJ. *J Strength Cond Res.* 2004; 18: 298-301.
3. Szymanski DJ, et al. *J Strength Cond Res.* 2007; 21: 1117-1125.